the OIL AND GAS JOURNAL

In Times of Material Shortages It's Wise to Buy

LONGER LIFE FRANKS MFG. CORP. WELL SERVICING AND DRILLING UNITS SERVICING UNITS

- Lasts Longer
- Minimum Maintenance
- Faster Rigging
- Faster Operation
- Faster Moving
- Lower Costs

LASTS LONGER: Owner reports unit purchased in 1934 has averaged 245 tubing and rod jobs each of its 16 years and is still in use.

MINIMUM MAINTENANCE: Owner reports repairs of only one flat tire the first year on Franks unit which handled 57 tubing jobs, 70 rod jobs, and 1105 hours of swabbing on 4,000 to 6,000 ft. wells.

FASTER RIGGING UP AND DOWN AND FASTER OPERATION: User reports 10-well average less than four hours per well to do complete rod job on 6,000 ft. wells. This included rigging up, preparing to pull, pulling rods, servicing pump, running rods, preparing to pump, and rigging down.

FASTER MOVING: When rigging down is finished you're on your way with all tools and crew right on the unit.

LOWER COST: Longer life, less repair, faster rigging and operation can only mean savings to both producer and contractor.

In times of material shortages it's wise to buy longer life Franks—**THE KING OF SERVICING UNITS.**

Franks Manufacturing Corp., Box 3218, Tulsa, Oklahoma.

Ask the Operator Who Uses Franks

FRANKS MFG. CORP. WELL SERVICING AND DRILLING UNITS

"on the SPOT" FIELD SERVICE

Franks maintains "On the Spot" centers at Casper, Great Bend, Mt. Vernon, Odessa, Kilgore, Houston, Alice, Compton, Calif., Seminole, and Tulsa. Each center is complete with stock of parts, factory trained personnel, shop facilities, and 24-hour service.

FRANKS MFG. CORP. WELL SERVICING AND DRILLING UNITS TULSA, OKLAHOMA

PRICE 50 CENTS TABLE OF CONTENTS PAGE 63 **MAY 17, 1951**

ROCKWELL ORIFICE METERS

Take high pressures in stride

WITH NEW LEAKPROOF STUFFING BOX

When the pressure is *up*, it will pay you to use Rockwell orifice meters. They have the exclusive advantage of a revolutionary new stuffing box that prevents leakage troubles at this vulnerable point. The unit is self-lubricated, requires no maintenance. The higher the pressure, the tighter it seals—yet the shaft will freely rotate even under extreme conditions.

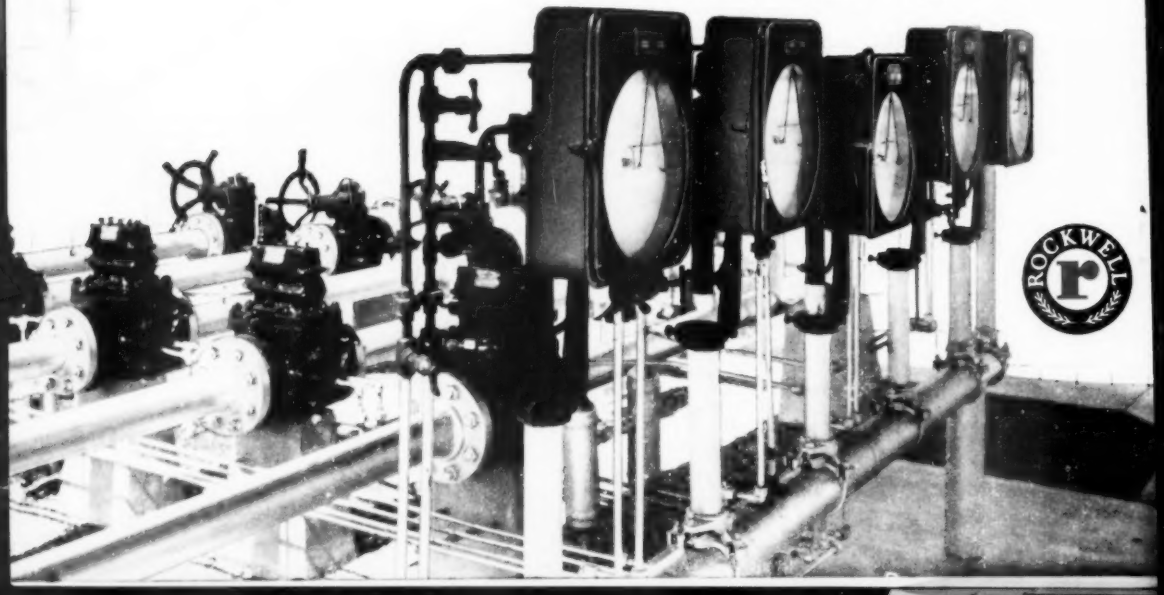
You'll get this new leakproof stuffing box *plus* forged steel chambers, unit manometer construction, positive inking pens and a host of other features in Rockwell orifice meters. For either high, low or intermediate pressures they are your best buy. Write for bulletin 1050.

Stuffing Box Details

This unit has a *combination packing and bearing* made of Teflon. The material is tough, chemically resistant, stands up to 400° F. and has a low coefficient of friction. Teflon flows slightly under pressure to adjust itself to the stuffing box body and the periphery of the shaft. It seals without binding! The spring loaded follower serves as a pilot to hold the Teflon in alignment. All other parts are stainless steel. Packaged stuffing box kits for converting meters in service are available.

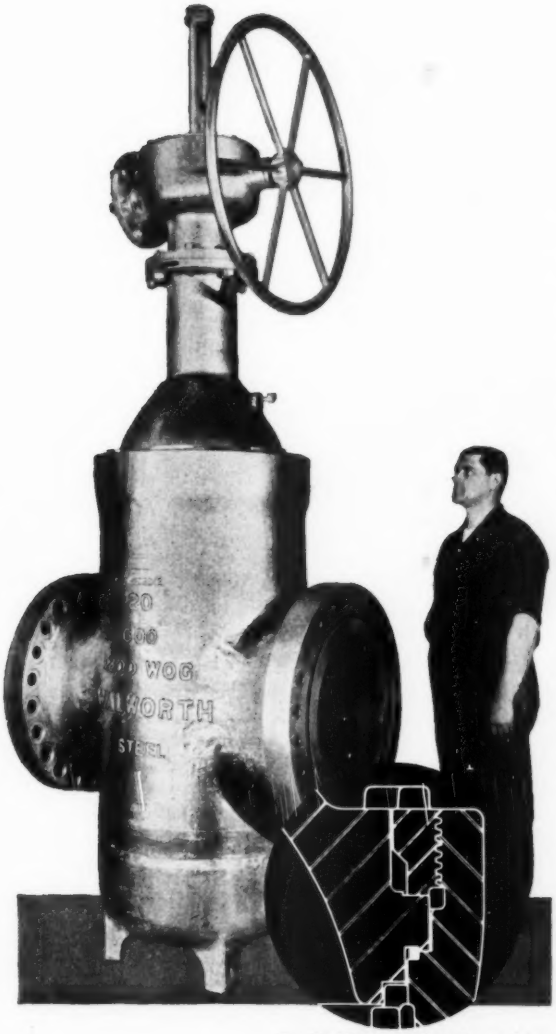
ROCKWELL MANUFACTURING COMPANY
Pittsburgh 8, Pa.

Atlanta • Boston • Chicago • Columbus • Houston
Kansas City • Los Angeles • New York • Pittsburgh
San Francisco • Seattle • Tulsa



Announcing the New WALWORTH TYPE 49 Steel Pipe Line Gate Valve

(PATENT APPLIED FOR)



Detail of Boltless Body-to-Bonnet Joint

These new Walworth valves have been designed on the through-port principle, with body and disc ports accurately indexed, and body ports bored to match connecting piping. These valves have no recesses to accumulate dirt and no obstructions to interfere with the free flow of liquid or passage of pigs or scrapers. Furthermore, these valves do not require any internal lubrication and may be installed without regard to flow direction. Walworth Type 49 Steel Pipe Line Gate Valves are made in sizes up to and including 30″ in Series 400 and 600. Valves have stellite seat rings, and the body-to-bonnet joint incorporates a Walworth boltless design. A detailed illustration of this joint is shown here.

For further information about these new Type 49 Steel Pipe Line Gate Valves, contact your nearest Walworth distributor.

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1951.

Big Wheels ..for Big Savings

The big, extra heavy flywheels of Fairbanks-Morse "ZC" Engines are an important advantage to you. They assure considerable fuel savings in gas or gasoline and much less wear on engine and driven equipment as compared to engines having much less flywheel effect. The big wheels store excess energy on the light load portions of the pumping cycle and use the stored energy on the heavy load portions of the cycle. Cyclic speed variations are virtually eliminated. This efficiency permits use of smaller size engines and a practically constant position of the fuel butterfly valve, thus assuring maximum fuel economy. Operators have reported fuel savings up to 50%. See the "ZC" at your supply store, or write Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE,

a name worth remembering

"ZC" ENGINES • PUMPS • ELECTRIC MOTORS • LIGHT PLANTS, GENERATORS • DIESEL AND DUAL FUEL ENGINES • SCALES

Operators everywhere rate it...

A #1

THE FIRST— AND STILL THE BEST

Old-timers remember when Baroid was introduced, more than 20 years ago, and how it made for safer, deeper, and more economical drilling. One of the outstanding things about this pioneer weight material is that operators who started using it, way back when, are still buying Baroid in preference to any other weight material. Why? Because they have found it consistently the best in high specific gravity, laboratory-controlled uniformity, freedom from grit, and in its ability to make maximum weight, minimum viscosity muds.

500 distributors make Baroid available within minutes of every active drilling area.

YOU CAN ALWAYS DEPEND ON

Baroid

BAROID SALES DIVISION
NATIONAL LEAD COMPANY
LOS ANGELES 12 · TULSA 3 · HOUSTON 2

COMPLETE DRILLING MUD SERVICE

Great **AMERICANS**

Nail down your PROFITS with
AMERICAN PUMPING UNITS

Proven equipment like American Pumping Units helps keep down operating expenses that eat away at profits. Write for Catalog 151 describing the right Unit for every service. Contact your favorite supply store or the nearest American office.

AMERICAN MANUFACTURING COMPANY OF TEXAS

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Tulsa, Okla., 1506 Hunt Building, Phone 4-8785
Kilgore, Texas, P. O. Box 222, Phone 2338
Odessa, Texas, P. O. Box 983, Phone 3472
New York, N. Y., 500 Fifth Ave., Ph. LA. 4-4857

FORT WORTH 1, TEXAS PHONE VALLEY 2301

This close-up clearly shows the ribs or corrugations which add strength to Childers Jacketing and also make it form more easily around lines. Aluminum strapping and seals are a quick, inexpensive way to attach the jacketing. They can be used without any special tools and take no special training for the installers.

Does long lasting aluminum cost too much for covering your insulated lines? Not when you specify this new type weatherproof jacketing. It has been specially developed to cost little more than ordinary temporary jacketing materials.

New Low-Cost Jacketing Cuts Maintenance on Insulated Lines

AT LAST an aluminum jacket has been "engineered" especially to protect outdoor lines in refineries and chemical plants. It is the first "permanent-type" jacketing that offers both low initial cost and low application cost.

After two years of tests and major installations at 431 outdoor locations in refineries, chemical plants, and power plants, the Childers Manufacturing Co. of Houston has rung up an impressive cost-cutting record with their Childers Aluminum Jacketing.

Secret behind this low cost is the thin Aluminum Sheet — .006" thick — which is the weather-protecting sheath of the jacketing. It is ribbed (as pictures show) for extra strength and to facilitate forming around the line. This aluminum has proved thick enough to resist weathering and usual abrasion, but costs much less than heavier aluminum sheets.

Easy application of this Childers Jacketing cuts labor bills drastically. It comes from the factory in easy-to-handle rolls that are four feet wide and either 100 feet or 200 feet long. It is light and flexible to handle as the men put it on the line. No roll forming required as with heavy, un-crimped material. It can be cut off and attached just the same as the old-fashioned tar-paper that was sometimes used for jacketing.

You can attach Childers Jacketing around your insulated lines by one of several easy methods. Tho use of aluminum strapping and seals is probably the best. Sheet metal screws or Minnesota Mining's No. 471 tape can also be used.

The Childers jacketing can be removed and re-used.

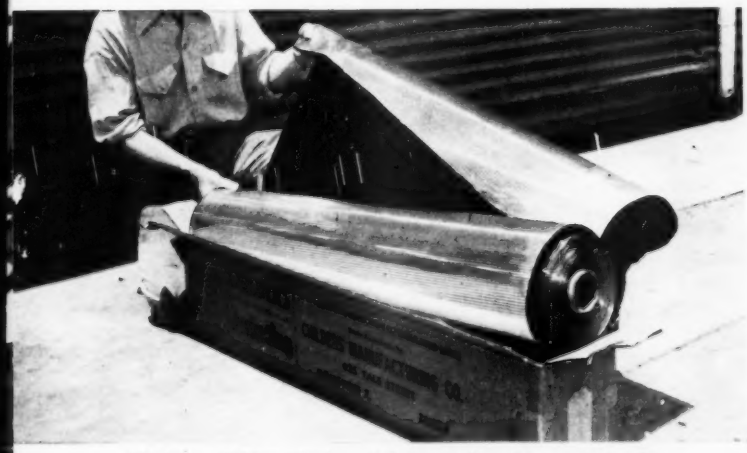
A moisture barrier is attached to the back of the jacketing to give positive protection for the aluminum when it is used with alkaline insulating materials.

No painting, no rust-proofing, little maintenance—that's the advantage of aluminum!

Hundreds of design engineers and maintenance engineers have agreed they save money for their firms and trouble for themselves by changing their jacketing specs to Childers 100%. That should make it worth your testing too—and a test roll costs only $40.00 for 400 sq. ft. (with moisture barrier attached—price for 800 sq. ft. without moisture barrier $62.00). That's a good investment in any plant. (Advt.)

★ ★ ★

FOR FULL INFORMATION write Childers Manufacturing Co., Dept. OJ-2, 625 Yale St., Houston 7, Tex., for complete literature. Childers has engineering representatives in principal cities to work with you on specific problems.



This is how Childers Aluminum Jacketing is shipped in easy-to-handle rolls. It is quite flexible, yet stands up under severe weathering.

(Advertisement)

THEIR JOB is to help you get..

Mr. Claude Waltz, operating a Bullard high-speed boring mill here, started at OIC in 1896, at age 19, as an apprentice machinist.

This new, modern Southwark-Emery physical test machine, in daily use, is one of the many mechanical aids added to the 40 years of precision engineering experience of Messrs. Malaney, Doster and Turner.

Mr. A. A. Kruse, factory trained in precision application of valves, is one of many O. I. C. representatives in various parts of the nation qualified and available to aid both distributors and users in valve application.

Precision Engineering of valve designs, Precision Manufacturing and Precision Application—OIC considers all three factors equally essential to good valving. OIC has the years of experience and the service organization to give you all three.

We point with pride to these veteran members of the OIC organization as evidence: Mr. Claude Waltz has been contributing precision machining for 54 years. Mr. D. B. Malaney, Metallurgist, Mr. H. G. Doster, Vice President in Charge of Engineering, and Mr. J. B. Turner, Product Engineer, combine 40 years of service in precision engineering. Mr. A. A. Kruse, Jr., who began in our Engineering Department, is now one of the many field engineers advising users on precision valve application in various parts of this country.

If you're needing valve *application know-how*, call the nearby OIC distributor for the help of a factory representative, or write direct to us. The Ohio Injector Company, Wadsworth, Ohio.

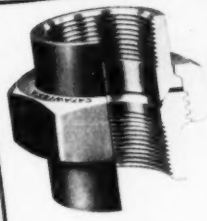
OIC
FOUNDED 1883

VALVES

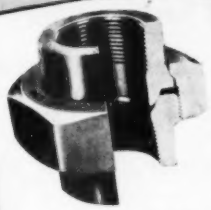
FORGED AND CAST STEEL · IRON · BRONZE

Catawissa Unions and Check Valves...

for greater operating efficiency and economy in every oil-field service

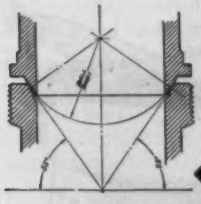


CATAWISSA NO. S-1A
The hot-forged steel union with heavy, coarse ACME threads in the union nut for quick make-up or disconnecting in the field.



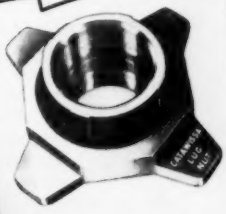
CATAWISSA NO. S-1
Hot-forged steel unions with U. S. Standard V-Threads in the union nut are recommended for general oil-field service.

CATAWISSA NO. 502 CHECK VALVE
Accessible, efficient, economical, Catawissa Double Union Swing Check Valves are full opening and are furnished with union connections on both ends, eliminating the union and nipple necessary to install the regular type check valve. They are the flow-line type designed for use where no stop is installed close to the check valve.



BALL-TO-ANGLE SEAT

CATAWISSA NO. L-1A
This union is furnished with a 2-lug nut which can be applied with either a hammer or wrench. The triangular shape eliminates distortion or breaking. Designed with coarse ACME threads for general service on drilling rigs and all piping purposes where quick make-up is desirable. Available in standard and double extra heavy weight. Sizes 1" to 3" inclusive.



CATAWISSA NO. L 1-4A
Made in 4-inch size with four lugs on the nut.

"OILWELL" store and warehouse points are stocked with a complete line of Catawissa forged-steel unions and check valves. These Catawissa products are designed and recommended for the rough-and-ready demands of any oil country application.

NOTE THESE IMPORTANT FEATURES

HOT-FORGED . . . from solid, rectangular steel bars, Catawissa Unions are free from sand and blow holes. They will expand and contract with the pipe, assuring tight joints.

THREADS . . . Catawissa Unions and Valves are supplied with either FULL ACME Threads or U. S. Standard V-Threads in the union nuts and on the female end.

SEATS . . . in all Catawissa Unions are a 55° angle on the female end to a Ball on the male end, assuring a perfect seal even when the pipe is not perfectly aligned. Carefully hand-ground seats which require no packing are inspected and tested under water to assure holding qualities.

Contact your nearest "Oilwell" representative to assist you with all your oil-field problems

OIL WELL SUPPLY COMPANY

Branches Serving All Oil Fields

Executive Offices—DALLAS, TEXAS
Export Division Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Division Offices—CASPER, WYOMING
COLUMBUS, OHIO...DALLAS, TEXAS
HOUSTON, TEXAS...TULSA, OKLAHOMA
LOS ANGELES, CALIFORNIA

USS "OILWELL"

UNITED STATES STEEL

To help America build faster...there's a brilliant new star in the sky...the Beechcraft

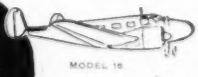
Twin-Bonanza

Range, high performance and ruggedness make this newest Beechcraft right for business — and right for military service, too. Designed primarily as a super-roomy, five-place executive plane, capable of seating six for medium-range flights, the Twin-Bonanza is a superb "short-cut" for defense-busy executives. For military use, this *one* plane can serve as a personnel transport, twin-engine trainer, photographic, ambulance or cargo plane — with resulting savings in procurement and maintenance.

The Twin-Bonanza has the ruggedness and safety of its noted Beechcraft predecessors. Structural and operational standards are far in excess of government requirements. Your Beechcraft distributor has detailed information on this new Beechcraft. Check with him today, or write Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

● Range at 60% power, 1 005 miles
Top speed at sea level, 200 mph
Cruising speed at 10,000 ft., 191 mph
Rate of climb, 1,650 fpm
Service ceiling, 20,400 ft.

Beechcraft



BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

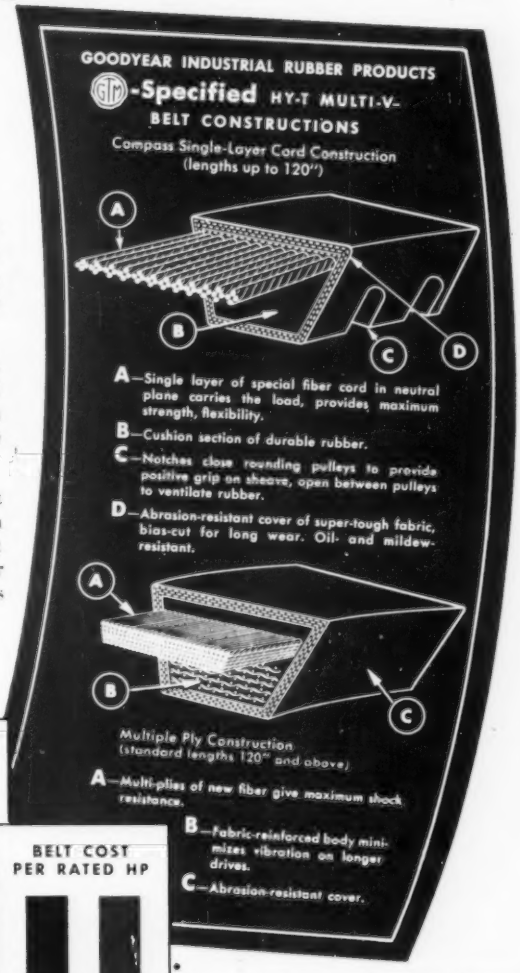
No other V-Belt matches Goodyear's Super-Rated HY-T

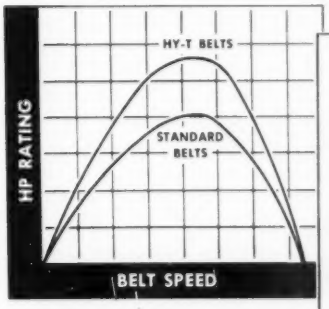
For Shock-Resistance
For Long Life
For Hard Work

NO other belt can match Goodyear's new HY-T Multi-V-Belt. Goodyear gives you a belt made with new chemically produced fiber that forms the load-carrying cords of these belts, provides greater strength and higher horsepower rating.

It has the strength of nylon—without its stretch. That means a super-rated V-Belt that will "soak up" the heaviest shock loads—last far longer than ordinary construction V-Belts even under extreme heavy-duty service.

Look at the charts here. See for yourself what HY-T Belts will do for you on your V-Drives. Then ask the G.T.M.—Goodyear Technical Man—about matched sets for your multi-drives. Or see your nearest Goodyear Industrial Rubber Products Distributor.


GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GT-Specified HY-T MULTI-V-BELT CONSTRUCTIONS
Compass Single-Layer Cord Construction
(lengths up to 120")
A
B
C
D
A—Single layer of special fiber cord in neutral plane carries the load, provides maximum strength, flexibility.
B—Cushion section of durable rubber.
C—Notches close rounding pulleys to provide positive grip on sheave, open between pulleys to ventilate rubber.
D—Abrasion-resistant cover of super-tough fabric, bias-cut for long wear. Oil- and mildew-resistant.
Multiple Ply Construction
(standard lengths 120" and above)
A—Multi-plies of new fiber give maximum shock resistance.
B—Fabric-reinforced body minimizes vibration on longer drives.
C—Abrasion-resistant cover.



*Includes Oil Resistant construction at no extra cost

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

HY-T, Compass—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

THE GREATEST NAME IN RUBBER

RAY-MAN 635-D BRAKE BLOCKS

(Key-Lok or Bolt-on)

When you're working against time, and with heavy strings of pipe . . . that's when you really appreciate the stamina and dependability of Ray-Man 635-D Brake Blocks!

These blocks stand up under continued punishment. And they feed off smoothly and evenly every time. Each block is reinforced with brass wire inserts at the back, but completely non-metallic on the wearing surface. Woven of unusually large asbestos yarns. Fully impregnated, even in the middle of the block.

Won't glaze drums, won't carbonize even when heavily overloaded. And they resist bleeding at high temperatures!

Key-Lok Attachment. Ray-Man 635-D blocks are available either drilled and countersunk for bolt attachment, or specially prepared for Key-Lok . . . the R/M development that makes it possible to *slide* blocks on and off. Key-Lok saves relining time. Eliminates bolt holes, too, thus providing greater friction surface and longer wear. No danger of scoring drums with bolt heads!

RAYBESTOS-MANHATTAN, INC.

WAREHOUSE STOCK: 2809 Taylor Street, Dallas, Tex.

OFFICES:

445 Lake Shore Drive, Chicago 11, Ill. • 4651 Pacific Blvd., Los Angeles 11, Calif.

Factories: Bridgeport, Conn. • Manheim, Pa. • Passaic, N.J. • No. Charleston, S.C.

RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Mechanical Rubber Products • Rubber Covered Equipment • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

RM

SAVE 5 WAYS on Pipe Threads

- FEWER MACHINES
- LOWER TOOL COST
- LOWER TOOL INVENTORY
- LESS SET-UP TIME
- HIGHER PRODUCTION

In tightening markets, Landis Pipe Threading Machines offer wide-open opportunities to cut production costs of pipe threads.

Three sizes of Pipe Machines will handle all diameters of pipe from 1/4" to 18". Each die head is constructed to handle a wide range of pipe sizes —for example the 6" machine will thread all diameters from 1" to 6". Universal size adjustment allows quick set-up. Thus, a few machines will handle the complete range.

Die heads employ Landis Tangential Pipe Chasers. Interchangeability of the chasers further increases the versatility of these machines. The same chasers may be used for all diameters of threads within the range of a given die head providing that the pitch, form, and taper remain the same, thus reducing tool inventory. Chasers need be replaced only one at a time as needed. Chasers last longer since 80% of their length may be reground as the cutting edge dulls. Line contact with the work reduces friction and chaser wear, allows use of higher cutting speeds, and reduces chaser breakage.

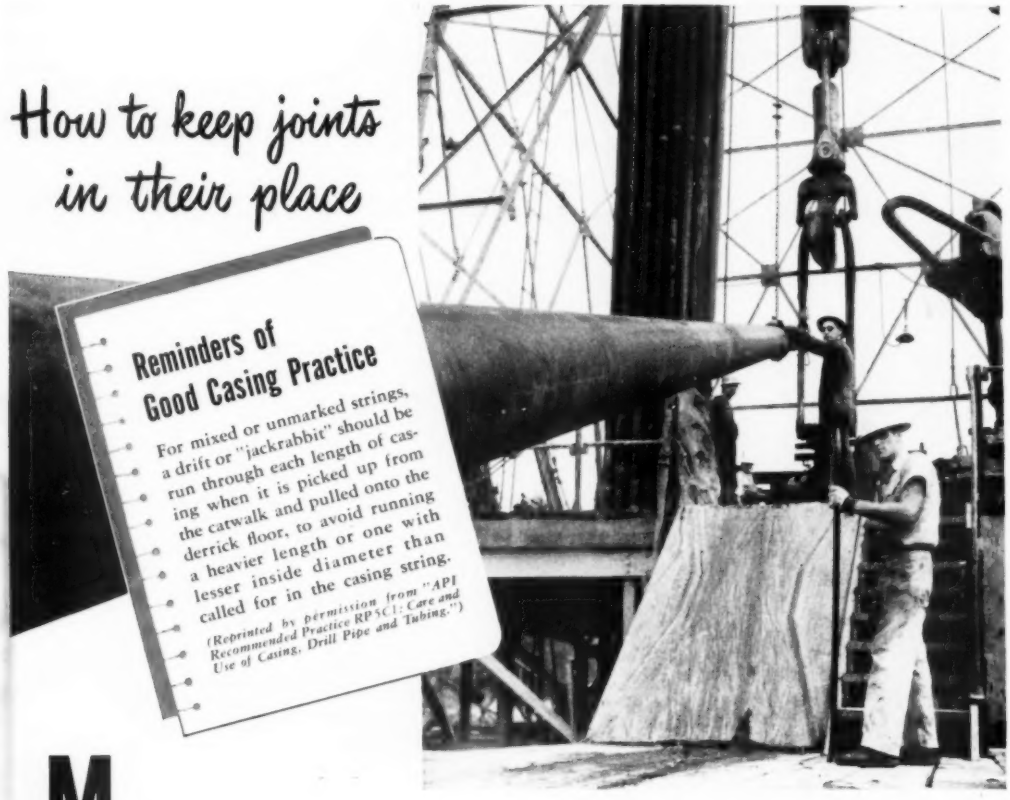
A separate type of machine, the Receding Chaser Pipe Machine, is especially designed to handle A.P.I. Tapered Pipe Threads. Chasers recede into the head at a rate equal to the taper of the thread, ensuring accurate and uniform taper along the full thread length. This mechanism allows the use of smaller chasers, lowering tool cost and dollar tool inventories. Leave-off marks are eliminated by this receding action.

Investigate how Landis Pipe Machines can reduce direct tool cost, increase daily production, and reduce investment in tool inventory and heavy machinery. Write for specifications and further information.

LANDIS Machine COMPANY
WAYNESBORO PENNA., U.S.A.

Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

How to keep joints in their place



Reminders of Good Casing Practice

For mixed or unmarked strings, a drift or "jackrabbit" should be run through each length of casing when it is picked up from the catwalk and pulled onto the derrick floor, to avoid running a heavier length or one with lesser inside diameter than called for in the casing string.

(Reprinted by permission from "API Recommended Practice RP5C1: Care and Use of Casing, Drill Pipe and Tubing.")

MAKE EVERY JOINT A STRONG POINT

with Republic Electric Weld Casing

This modern casing tongs up to high joint strength . . . guards against costly pull-outs. Made by the improved Republic Electric Resistance Welding Process, it is uniformly round and uniform in wall thickness.

Joints have added pull-out strength because plenty of tough steel is left beneath thread roots at every point. Full-formed threads, solidly anchored in a uniform depth of tough steel, take hold with a bulldog grip.

Republic Casing offers extra resistance to severe external pressures, too. It is cold formed from high ductility steel . . . fully normalized for uniform wall structure . . . cold sized to further increase its high yield strength.

Every joint *is* a strong point when strings are run with Republic Electric Weld Casing and Tubing —field-proved by the many millions of feet which have been placed in service.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic Electric Weld Casing and Tubing are made from flat-rolled steel, both sides of which are inspected. Thus, the surface which becomes the inside wall is free from hidden defects.

REPUBLIC *Electric Weld*
NORMALIZED CASING AND TUBING

REPUBLIC STEEL

Other Republic Products include Line Pipe—Carbon, Alloy and Stainless Steels—Upson Studs, Bolts and Nuts—Electrunite Heat Exchanger Tubes

A Big Forward Step In The Measurement and Transmission of Flow

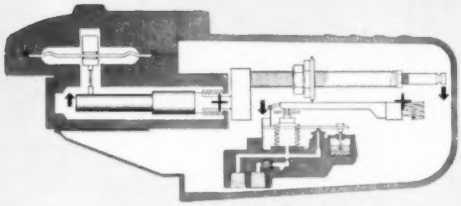
INTRODUCING *the New*

BROWN DIFFERENTIAL CONVERTER

(pneumatic-balance flow transmitter)

Easy Field Calibration –without water column

No Strainers Required



Functional schematic cross-section of the Brown Differential Converter . . . showing its utilization of the pneumatic-balance principle.

Easily Cleaned

Wide Rangeability –in one unit, 20 to 200" H_2O

Fast Speed of Response

Easy to Install

No Mercury or Seals

AFTER long and rigorous testing in the field, the Brown Differential Converter is ready to set new high standards of simplicity and precision in the measurement and transmission of flow.

Operating on the pneumatic-balance principle, this compact and lightweight unit converts differential pressure at the orifice into a proportionate output air pressure which is a measure of flow. Range is continuously adjustable, from 0-20 to 0-200 inches of water. All adjustments are easily and simply made, without special tools or extra parts.

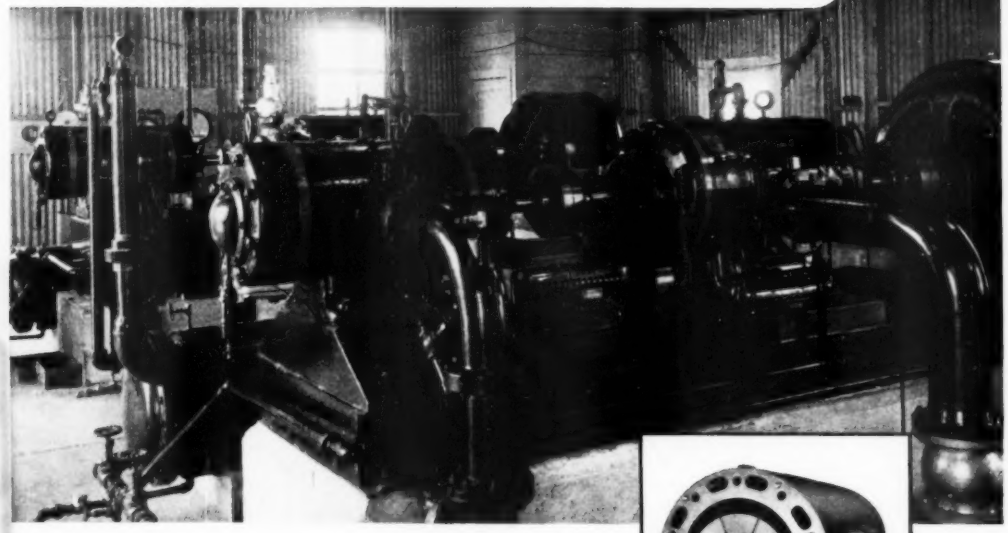
Applicable to a wide range of continuous processes, the Brown Differential Converter is the forerunner of an entirely new series of pace-setting developments made possible through Brown *Creative Instrumentation*. For detailed information write for a copy of new Catalog 2281 . . . and call in our local engineering representative for a discussion of your process needs. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

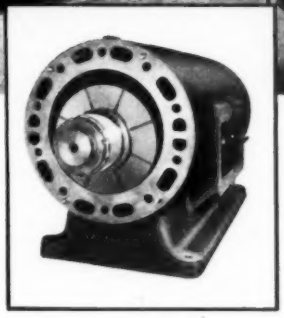
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4488 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

GIVING GAS A BETTER BOOST





Two of the four two-stage Natural Gas Boosters used on a lease at Borger, Texas. 1,500,000 SCFD with atmospheric inlet pressure or 2,500,000 SCFD with 10-psig. inlet pressure can be handled. Operating speed—575 rpm. direct motor drive. Compression—to 70 psig. discharge.

Out-of-the-way locations, or unattended operation, need not make an expensive job of boosting pressure to trunk line levels. The solution lies in spotting Fuller Rotary Compressors where needed. These high-capacity boosters reduce maintenance costs, cut inspection time to a minimum. They're dependable, too, because they've been engineered for a life-time of new machine performance.

Fuller multi-vane construction eliminates pulsing and vibration, as well as valves and other complicated parts. Blades automatically compensate for wear. Because moving parts are few—rotor, bearings, and blades—little attention is needed. Full compressor capacity is maintained for the life of the machine.

If you're interested in bringing maximum efficiency and lower operating costs to your operation, get in touch with a Fuller engineer. Write for Bulletin C-5—it describes Fuller Rotary Compressors in detail.

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4

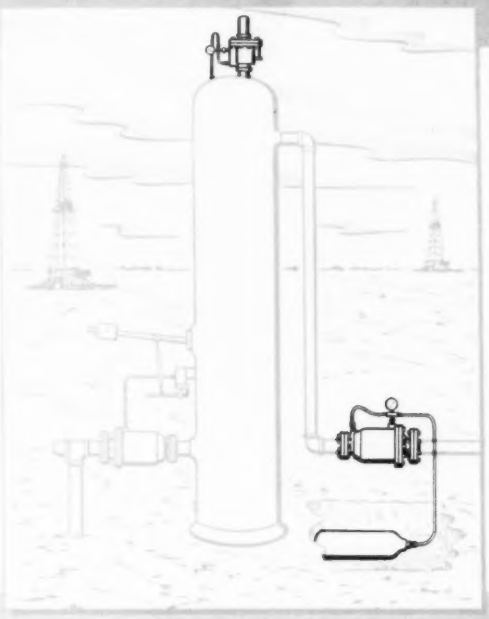
DRY MATERIAL CONVEYING SYSTEMS AND COOLERS
COMPRESSORS AND VACUUM PUMPS
FEEDERS AND ASSOCIATED EQUIPMENT

fuller

C-208

GROVE

MODEL 888 PRESSURE LOADED RELIEVER



ON GAS SEPARATOR LINES

HOLDS CONSTANT PRESSURE ASSURES TIGHT SHUT-OFF WITHOUT MOVING METAL PARTS

The unique operating principle of the Grove Model 888 Flexflo Reliever makes its action smooth and positive. This dependable service cannot be obtained from any other valve. There are no moving metal parts, springs, or weights to stick and jam. Pressure does the work, opening and closing the Flexflo Reliever with positive action.

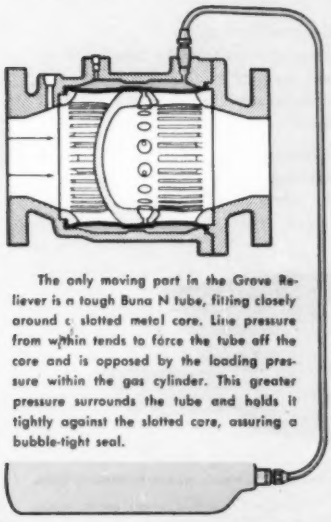
As a back pressure regulator, the Grove Reliever will unfailingly hold a constant pressure on the Separator and insure operation at maximum efficiency.

In the vent line the Grove Reliever will give dependable protection against excessive pressure and eliminate the expense and waste of leaking gas.

Specify Grove Model 888 Relievers with the proved Flexflo principle on your Separators for the best in efficient, trouble-free service.

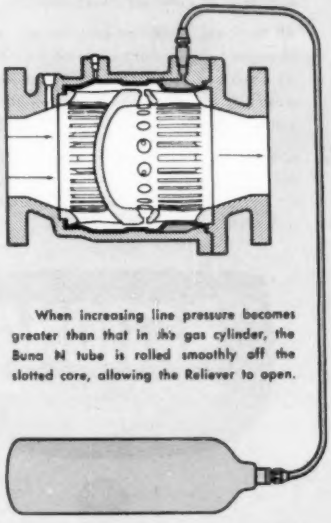
flexflo LETS PRESSURE DO THE WORK

CLOSED POSITION



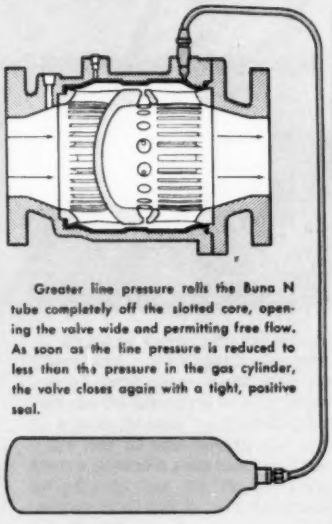
The only moving part in the Grove Reliever is a tough Buna N tube, fitting closely around a slotted metal core. Line pressure from within tends to force the tube off the core and is opposed by the loading pressure within the gas cylinder. This greater pressure surrounds the tube and holds it tightly against the slotted core, assuring a bubble-tight seal.

PARTIALLY OPEN POSITION



When increasing line pressure becomes greater than that in the gas cylinder, the Buna N tube is rolled smoothly off the slotted core, allowing the Reliever to open.

WIDE OPEN POSITION



Greater line pressure rolls the Buna N tube completely off the slotted core, opening the valve wide and permitting free flow. As soon as the line pressure is reduced to less than the pressure in the gas cylinder, the valve closes again with a tight, positive seal.

GROVE REGULATOR COMPANY

1901 CALUMET, HOUSTON, TEXAS • 6529 HOLLIS ST., OAKLAND, CALIF.

NATIONAL

wellhead combinations

Any combination of well conditions can be handled by a National assembly . . . scores of components in all standard sizes let you make hundreds of different assemblies quickly.

All National Wellhead components are designed and made pressure-tight . . . are checked by ultra-sensitive tests to make sure all parts are sound and homogeneous. Each element of a National assembly is generously proportioned and conservatively rated to sustain maximum loads under all conditions.

Bulletins describing all the components of National Wellhead Assemblies are available from the National Supply Store near you. Or ask your National Supply field man for information and technical assistance.

THE NATIONAL SUPPLY COMPANY

GENERAL SALES OFFICES: TOLEDO, OHIO

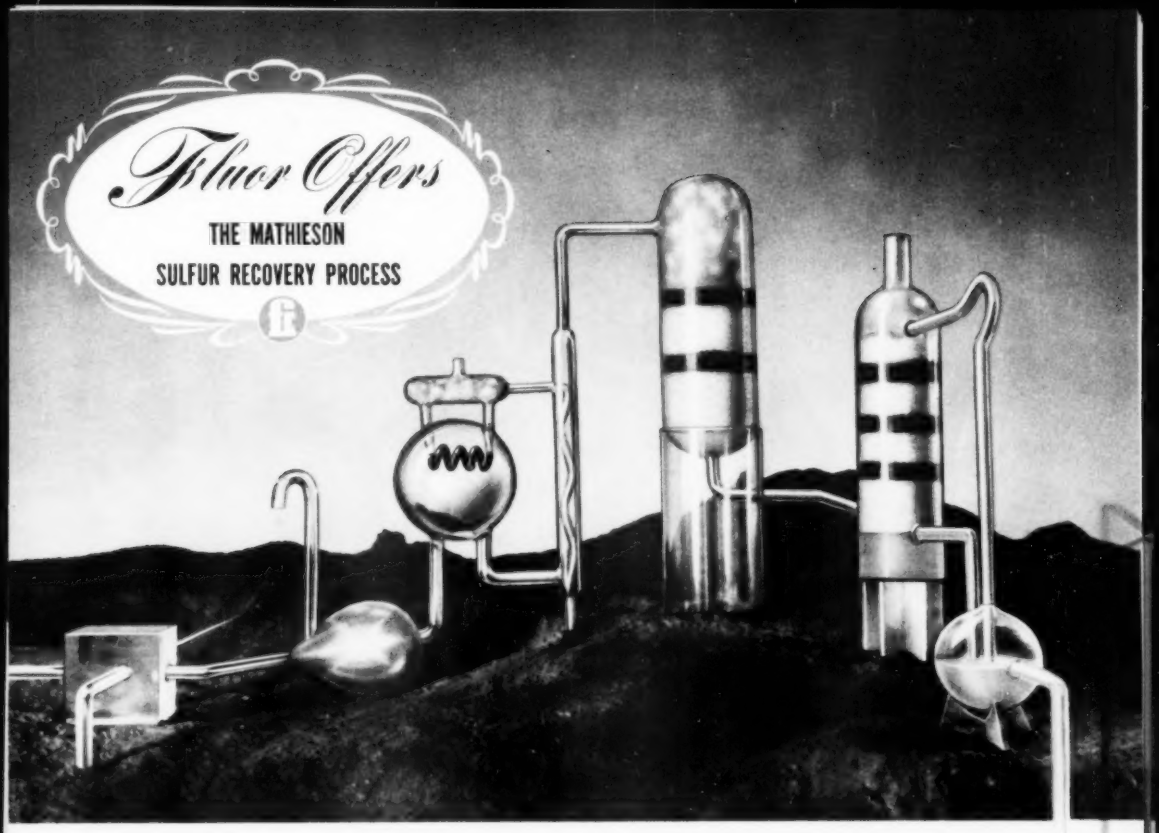
NATIONAL BLUE PRODUCTS

DIVISION OFFICES: CASPER, FT. WORTH, PITTSBURGH, TULSA, TORRANCE.

CANADA: THE NATIONAL SUPPLY COMPANY, LIMITED, ROOM 202, ALBERTA BLOCK, CALGARY, ALBERTA.

EXPORT: NATIONAL SUPPLY EXPORT CORPORATION, 30 ROCKEFELLER PLAZA, NEW YORK, N. Y., U. S. A. RIVER PLATE HOUSE, 12 SOUTH PLACE, LONDON E. C. 2.

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT . . . SPANG PIPE . . . SUPERIOR & ATLAS ENGINES



A simple process for the conversion of waste hydrogen sulfide to pure elemental sulfur

The availability of sulfur is rapidly becoming critical to the refining industry. First pinch was evident when sulfur and sulfuric acid were placed under allocation control by National Production Authority.

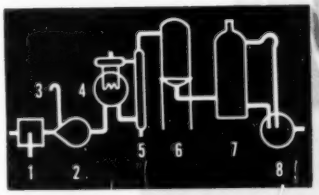
Primary cause of sulfur allocation is a gradual depletion of known deposits. Secondary cause is the great demand for sulfur in the manufacture of vital defense program materials. Mined sulfur is the normal source for such materials. The refiner, however, has in most cases his *own* potential source of sulfur.

Recovery from waste

The refiner's answer is the Mathieson Process for converting into sulfur the waste hydrogen sulfide recovered from sour petroleum gases. This simple process – available through The Fluor Corporation, Ltd. – accomplishes *two* important purposes:

1. *Guarantees independent supply* by affording each refiner an independent sulfur supply to meet his particular requirements – protection for the present, additional income for the future.

2. *Conserves for national defense* by contributing to the over-all National Defense Program in helping to conserve a critical commodity.



THE MATHIESON SULFUR RECOVERY PROCESS
Hydrogen sulfide, recovered from a sour gas stream, is partially burned with air—cooling follows with steam generated being utilized for power. Combustion gases are then passed through a catalyst tower to form sulfur and water vapor. Elemental sulfur product is condensed in a wash tower by direct contact with cooled liquid sulfur. The result is pure commercial sulfur—ready for sale or for conversion into sulfuric acid.

1—TREATING PLANT, 2—REACTOR FURNACE, 3—AIR INTAKE, 4—WASTE HEAT BOILER, 5—ECONOMIZER, 6—CATALYTIC CONVERTER, 7—SULFUR WASH TOWER, 8—RECIRCULATING SUMP

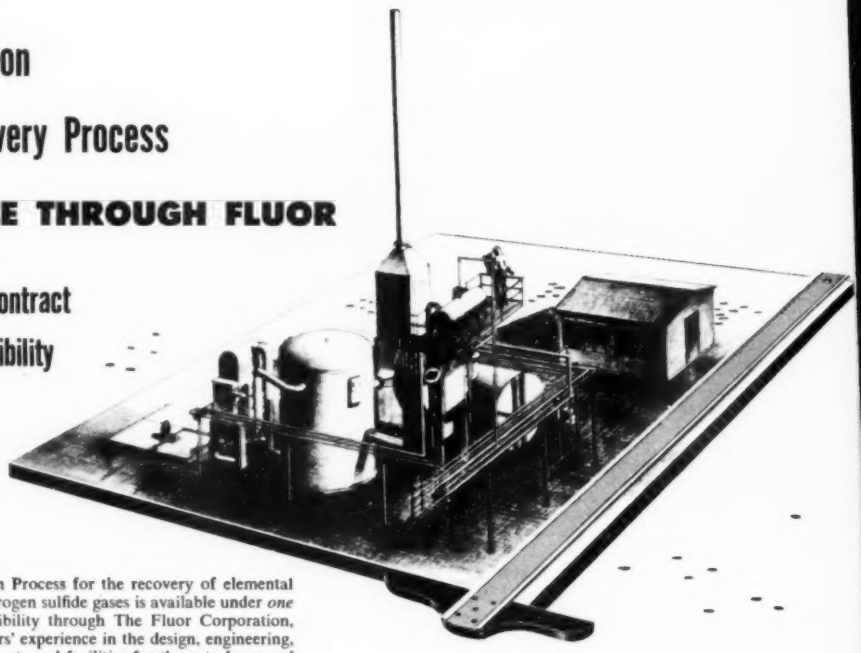
See Reverse Side

The Mathieson

Sulfur Recovery Process

AVAILABLE THROUGH FLUOR

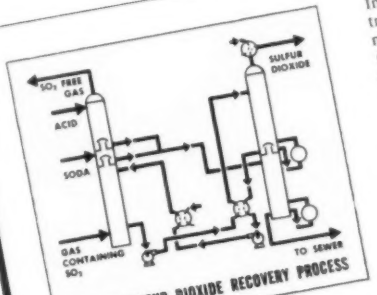
- Under ONE Contract
- ONE Responsibility



The proven Mathieson Process for the recovery of elemental sulfur from waste hydrogen sulfide gases is available under *one* contract, *one* responsibility through The Fluor Corporation, Ltd. With over 30 years' experience in the design, engineering, and construction of plants and facilities for the petroleum and chemical industries, Fluor possesses the background, the skilled personnel, and the know-how essential for the practical interpretation of the Mathieson Process into *your particular* sulfur recovery program.

Fluor is in a position to make economic studies covering every phase of proposed sulfur recovery installations—initial investment, operating costs, and returns to the investor.

A process for the recovery of Sulfur Dioxide is also available through FLUOR



ASARCO SULFUR DIOXIDE RECOVERY PROCESS

In line with Fluor's expanding activity in the fields of gas treating and sulfur recovery, arrangements have been made with the American Smelting and Refining Company (ASARCO) for Fluor to design, engineer and construct sulfur dioxide recovery plants using the ASARCO Process. Fluor's investigations have shown this process to be the most suitable of any available for the removal and recovery of pure sulfur dioxide from stack gases. In the application of the process, the gas is scrubbed with dimethylaniline which is then fed to a stripping column for sulfur dioxide recovery in a cyclic process. The resulting sulfur dioxide product may be dehydrated and liquefied for sale as liquid SO_2 or fed directly to an acid or sulfur plant.

All details including first studies are available through The Fluor Corporation, Ltd., and the American Smelting and Refining Company.

BE SURE WITH

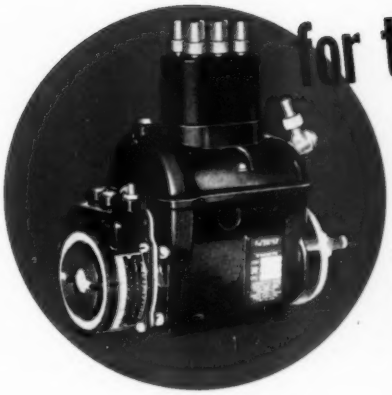
FLUOR

THE FLUOR CORPORATION, LTD., 2500 S. Atlantic Blvd., Los Angeles 22, Calif.

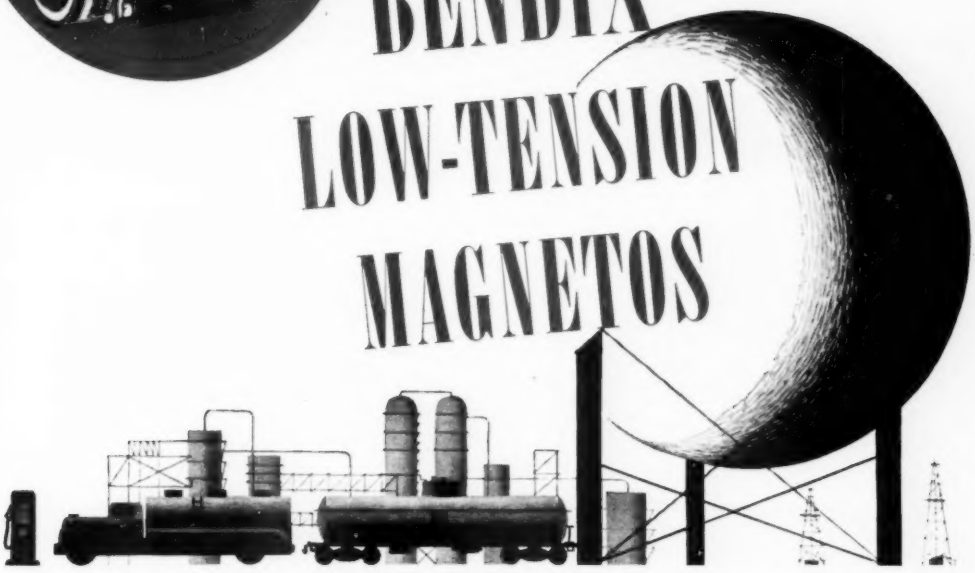
New York, Chicago, Boston, Pittsburgh, Tulsa, Houston, San Francisco, Birmingham, Calgary.

REPRESENTED IN THE STERLING AREAS BY: Head Wrightson Processes Ltd., Teesdale House, Baltic Street, London, E.C.1., England

Designed for the Petroleum Industry—



BENDIX LOW-TENSION MAGNETOS



It's the magneto designed to eliminate fire hazard, foremost problem of the petroleum industry. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature, Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low-tension voltage to the high-tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

For safety and low operating costs it will pay you to specify Bendix Low-Tension for all your magneto requirements. Complete data available on request.

- **Low Plug Erosion Rate**
- **Breaker Type Distributor**
- **Ventilation without Fire Hazard**
- **Radio Shielding Available**
- **Variable or Fixed Ignition**

Bendix

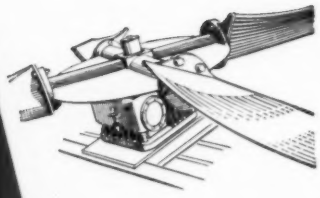
SCINTILLA MAGNETO DIVISION OF SIDNEY, NEW YORK

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

Bendix AVIATION CORPORATION

FACTORY BRANCH OFFICES:

117 E. Providencia Avenue, Burbank, California · 23235 Woodward Avenue, Ferndale, Michigan · 7829 W. Greenfield Avenue, West Allis 14, Wisconsin
582 Market Street, San Francisco 4, California



Cleveland Cooling Tower Drives (built in sizes 50 CU to 500 CU inclusive) are rated under Class 2 service conditions, except that thermal limitation does not apply. Heavy, externally ribbed housing effectively dissipates heat to air stream.

Cleveland Type CU...ideal drive for cooling towers

● This worm gear drive is designed specifically for cooling tower service. It meets a long-felt need for a compact, heavy duty speed reducer that will operate continuously, at high speeds and for long periods. It is inherently quiet in operation. Extreme conditions of heat and humidity do not affect it. It carries high thrust loads and high radial loads without loss of efficiency. It lends itself to rugged mounting, and due to the simplicity of its design, it is easily installed, serviced and adjusted in the field.

Every CU drive is run in and pretested under load before it leaves the factory. Thousands of units now in use prove its reliability in all classes of service—in the oil fields, in industry, in air conditioning systems in commercial and public buildings—in short, wherever there's a cooling tower, you can depend on CU.

Write for Bulletin 135 for full description of Type CU. Ask also for free literature on other Cleveland units. The Cleveland Worm & Gear Co., 3286 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

Keep temperatures— and costs—in line

PC FOAMGLAS
the long life insulation

PC Foamglas is entirely composed of millions of minute cells of still air enclosed in glass. Therein lies the secret of its insulating efficiency and the long lasting service that means insulating economy.

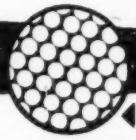
Still air is generally recognized as an unusually effective barrier to heat travel. And glass is practically impervious to attack by many elements that cause other materials eventually to lose their insulating efficiency. That is why Foamglas, when properly installed, retains its original insulating value.

On hot and cold piping and fittings—indoors and outdoors—on towers, tanks and processing equipment, PC Foamglas has proved its ability to help maintain predetermined temperatures. That sort of service, plus freedom from costly repairs, maintenance and replacement, makes PC Foamglas an important factor in keeping insulating costs in line.

PC Foamglas is available in standard flat blocks, curved segments and beveled lags, to fit equipment sides, heads and domes, and in preformed sections for standard size pipe and fittings.

Make sure you have the latest information on PC Foamglas. Just send in the convenient coupon for a sample of Foamglas and a copy of our informative booklet.

These workmen are applying PC Foamglas to asphalt storage tanks at American Liberty Oil Company, Mt. Pleasant, Texas. The constant insulating efficiency of Foamglas will help maintain the required temperature of 450°F. for this equipment. Insulation Contractor: The Aber Company, Inc., Houston, Texas.



THIS MAGNIFIED DIAGRAM shows that PC Foamglas is composed almost entirely of still air, which is sealed in minute glass cells. The black areas indicate glass, the white areas air. The insulating properties of still air and the unusual resistance of glass to moisture, chemicals and other elements that cause insulation to deteriorate, make Foamglas an exceptionally effective, long lasting insulating material.

Pittsburgh Corning Corporation
Dept. DD-51, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation a sample of Foamglas and your FREE booklet on the use of PC Foamglas for Industrial Insulation.

Name.....

Address.....

City.....State.....

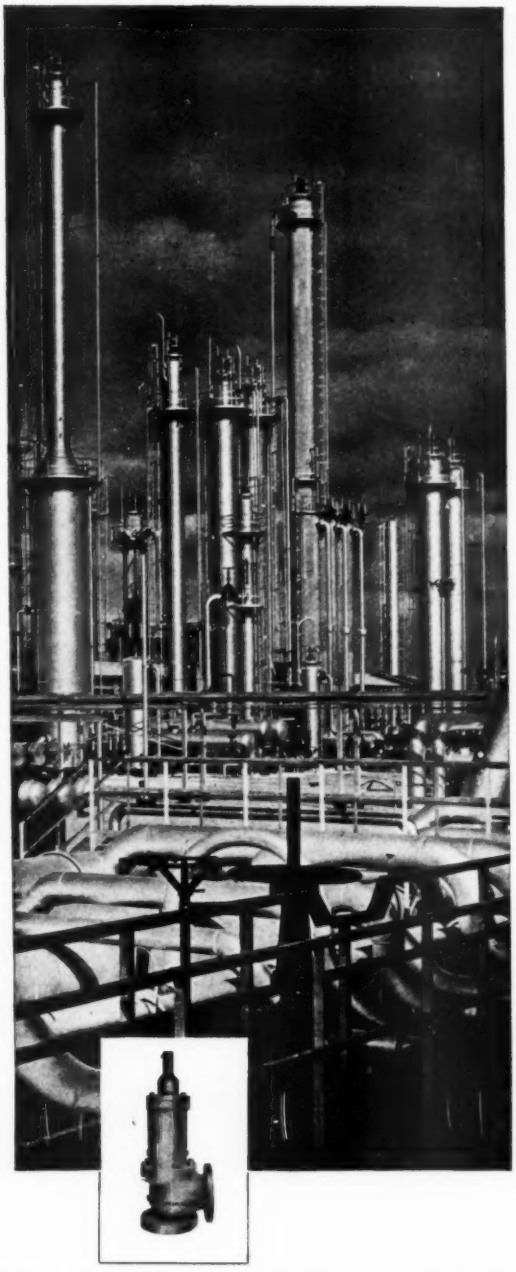
PITTSBURGH ® PC CORNING

FOAMGLAS cellular glass INSULATION

... when you insulate with FOAMGLAS ... the insulation lasts!

WHERE *Safety* COMES FIRST

...CONSOLIDATED STANDS GUARD



ABSOLUTE SAFETY is the watchword of the Magnolia Petroleum Company as a plant operator. That is why Consolidated Safety Relief Valves stand guard at this natural gasoline and cycling plant of the Seeligson field and gas unit operations near Premont, Texas.

These modern valves are designed and constructed for absolute safety under all conditions of service. Incorporated in every Consolidated Safety Relief Valve are guardians of safety found in no other valve. For example . . .

Fixed Capacity Is Built In. Dependence on the position of multiple adjustable blowdown rings is entirely avoided. Lift or secondary annular orifice areas are not disturbed—a single adjustment controls blowdown and prevents alteration during maintenance.

Leakage Is Prevented under discharge piping stresses, because of the outside bevel seat and floating guide construction of Consolidated Safety Relief Valves. Dependable tightness is assured no matter how severe the conditions of use.

25% Fewer Parts—the ultimate in design simplicity—minimize maintenance and standardization problems and save in long-life operation.

The petroleum industry has a tremendous job to do in these critical times. With demands on productive capacity growing day by day, it is more important than ever that plants and workers be fully protected against accidents. Consolidated Safety Relief Valves are reliable, alert guardians of life and property. Be safe—specify them.

Your local distributor will gladly give you complete information.

CONSOLIDATED SAFETY RELIEF VALVES

A product of MANNING, MAXWELL & MOORE, INC. TULSA, OKLAHOMA

MAKERS OF 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL AND 'MICROSEN' ELECTRICAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

Graph-Mo steel cam machines 25 to 30% easier —and stays precise after 40,000 hours' operation!

MAKERS of the Ferguson roller gear drive were looking for a steel for the cam that would be extremely wear-resistant, yet easy to machine. The steel they were using caused high cutter-breakage.

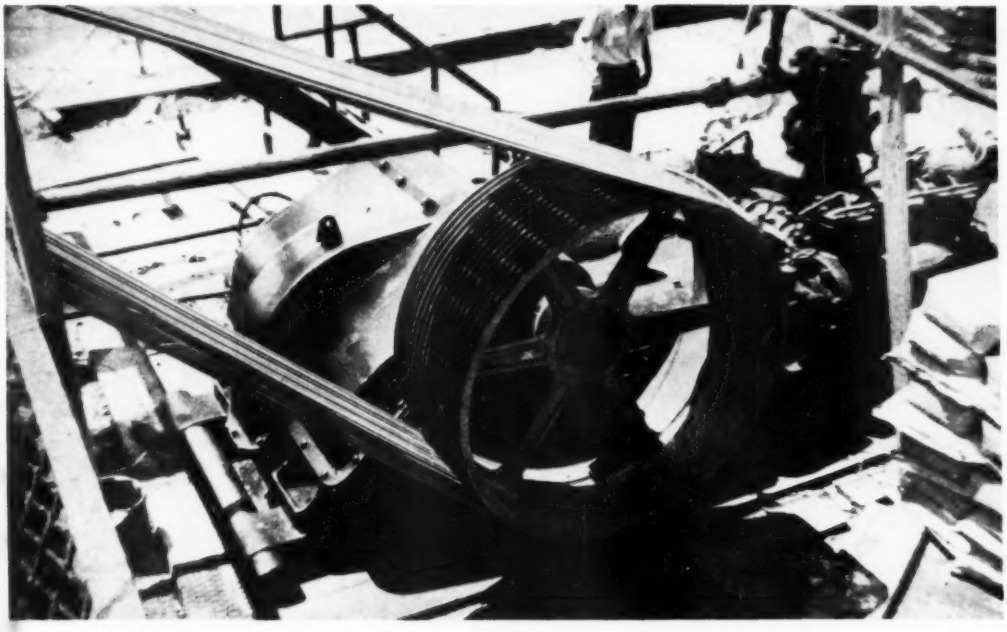
Metallurgists at the Timken Company recommended Graph-Mo. Ferguson reports these results: "Graph-Mo improved machinability 25 to 30%. There is little or no distortion in heat treating—good surface wear. We do not know of a cam ever wearing out. Precision has been maintained on multi-color printing presses—without replacement of cams—after more than 40,000 hours running time."

Graph-Mo is one of four Timken® graphitic tool steels. Because they contain free graphite, they machine faster and easier than other tool steels. This free graphite, together with diamond-hard carbides formed during heat treatment, provides excellent resistance to wear and abrasion. Other advantages are superior non-seizing qualities, good stability, less tendency to scuff and score, and uniform response to heat treatment.

For information on Timken graphitic tool steels—and their wide application for gages, dies and machine parts, get the new 9th edition of "Timken Graphitic Steel Data Book". The Timken Roller Bearing Company, Steel and Tube Div., Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.



Born in The Oil Fields

now the top choice of all industry and still your best V-drive buy

That's a picture of the sheave that got its start in the Southwest and is now used more often—in all industry—than any other.

What's so good about the Worthington QD?

It's easy to get on, easy to get off, yet always tight on the shaft. Two-piece construction—you first put the light-weight, split hub on the shaft and lock it; then you slip the taper-bored rim over the cone-tapered hub and use the long pull-up bolts to make a positive press fit on the shaft.

Changing sheaves is just as easy. You use the bolts as jack screws to remove the rim; the hub stays put, so there's no re-alignment problem.

It's stronger, too. Only Worthington designs each size for the load it will carry—instead of proportioning the whole line from one design. And note those I-beam spokes—lighter, but stronger.

Service is good. Local distributor stocks—a complete range— are backed by factory stocks in Los Angeles, Fort Worth, Houston, Tulsa and New Orleans. Ask for Worthington QD*.

*Trade Mark

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

WORTHINGTON PUMP AND MACHINERY CORPORATION

MULTI-V-DRIVE SALES DIVISION

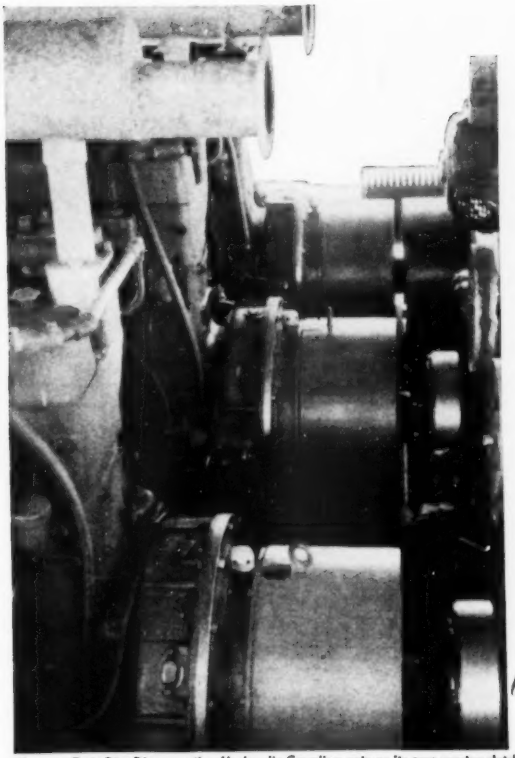
Buffalo, New York

POWER TRANSMISSION: sheaves, V-belts, variable speed drives

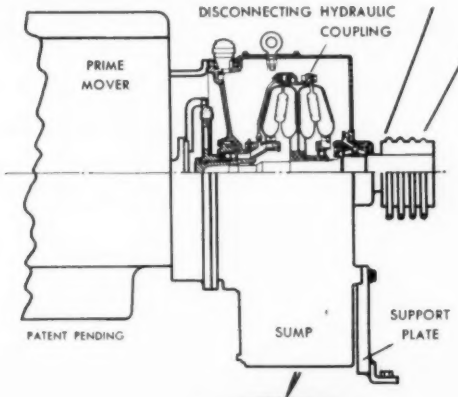
PUMPS: centrifugal, power rotary, steam

AIR COMPRESSORS: water-cooled, air-cooled

MV.1.11



The new Twin Disc Disconnecting Hydraulic Coupling acts as its own master clutch.



40,000 Feet With No Down-time

Mechanical rigs equipped with the *new* Twin Disc Disconnecting Hydraulic Coupling are *making hole faster*—with far *less maintenance*—than ever before.

Take, for example, the Emsco GA-500 Drawworks, operated by O'Neal Drilling Company in West Texas fields. This rig has been in almost continuous operation since last March, when the HUD Couplings were installed, and, to date, has drilled better than 40,000 feet of hole.

"We have had no chain breaks and practically no chain wear, no clutch, bearing or engine failures since the couplings were installed," reports J. T. O'Neal, Jr.

The Model HUD gives you all the advantages of fluid power in a unit that acts as its *own master clutch.* The hydraulic fluid is "dumped" and held temporarily in a reserve whenever a complete disconnect is desired.

The HUD assures power that "hangs on" because the *engine can't stall.* All "jerks," "jolts," "jumps" are cushioned. The operator can feel his way into a load with the throttle control alone. And, for a complete disconnect, he can actuate a valve to temporarily drain the hydraulic fluid.

For top performance from your mechanical rig, equip it with a Twin Disc Model HUD—the Hydraulic Coupling which acts as its own master clutch. Write for complete information.

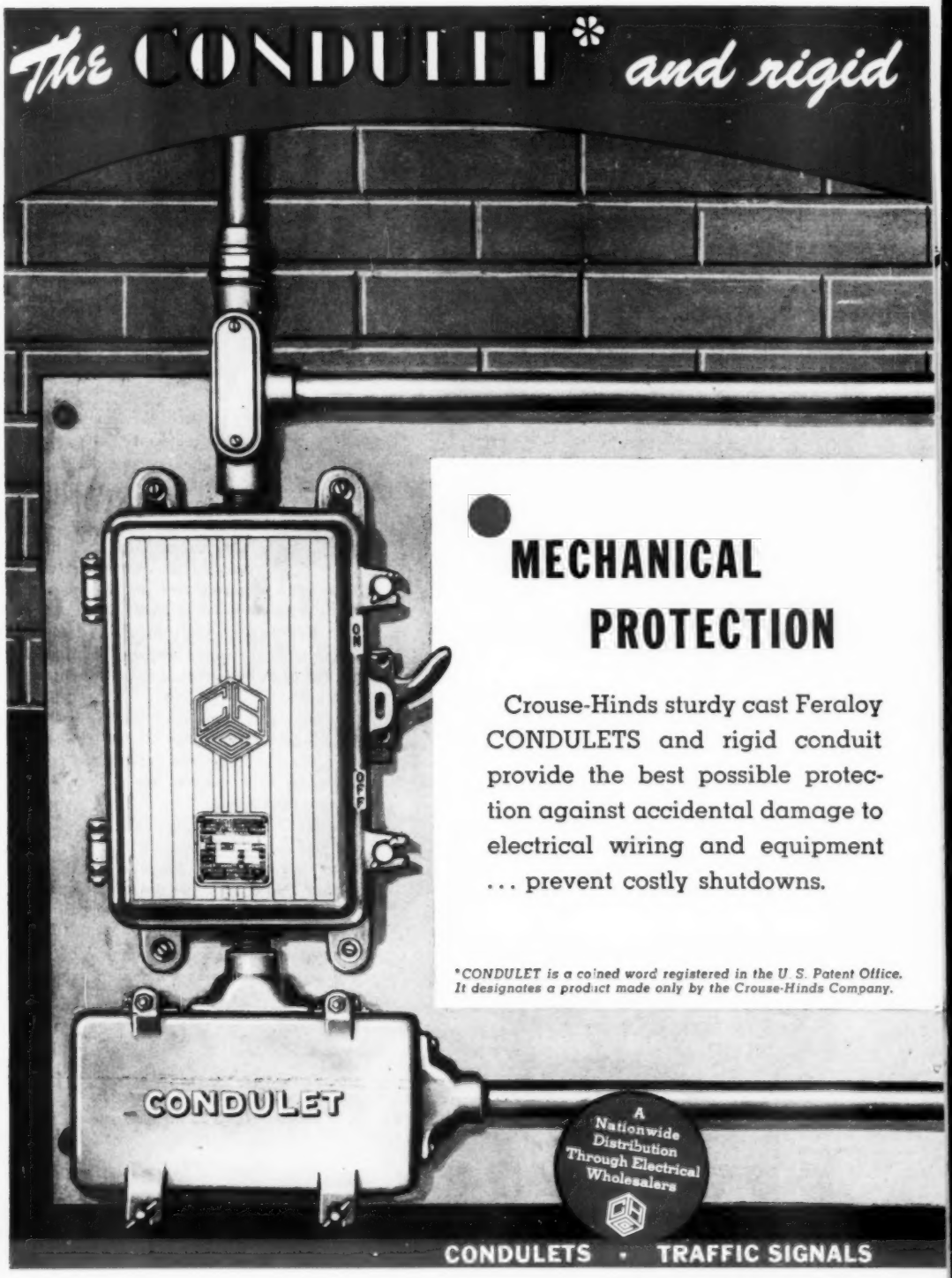
TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

Clutches & Hydraulic Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

The CONDULET* and rigid



MECHANICAL PROTECTION

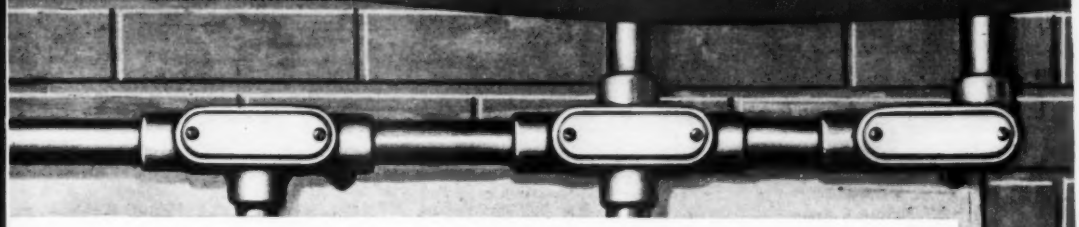
Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to electrical wiring and equipment ... prevent costly shutdowns.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

conduit method gives you

MAXIMUM PROTECTION

to wiring and equipment



Other definite advantages

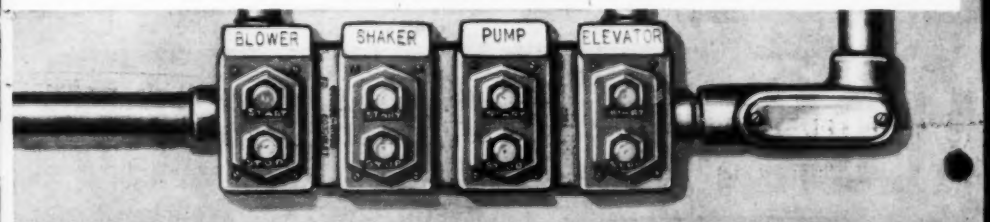
- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **SAFETY.** Ground continuity is of vital importance. CONDULETS with taper threaded hubs and rigid conduit with tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This safety feature assures maximum protection against personal injury and fire.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **FLEXIBILITY.** A modern CONDULET installation provides for growth and changing conditions. CONDULETS with detachable hub plates can be used to make it easy to change circuits or add new ones.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **SECURE ATTACHMENT** of devices. The mounting holes in CONDULETS are drilled and tapped in the cast metal body . . . no weak mounting ears to twist off.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

CROUSE-HINDS COMPANY

Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City
Los Angeles — Milwaukee — Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle
St. Louis — Washington. *Resident representatives:* Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.



AIRPORT LIGHTING · FLOODLIGHTS

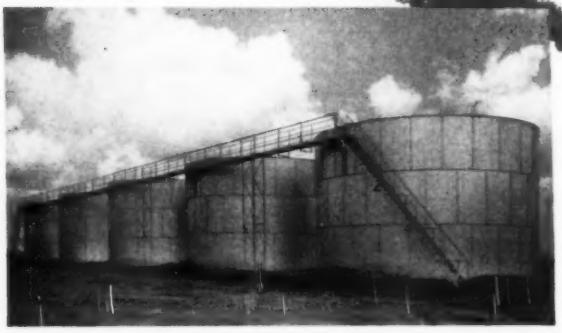
Pretesting

IN

MALONEY-CRAWFORD PLANT

ASSURES TIGHT FIT WITH COMPLETE INTERCHANGEABILITY OF PLATES IN THE FIELD . . .

Maloney-Crawford bolted steel tanks are made to rigid (beyond API requirement) Specifications. Yet, to make sure of perfection, Maloney-Crawford makes periodic shop inspection of the plates by actually constructing a tank in the plant, as shown above. Specify Maloney-Crawford for a strong, well made product.



Stocks and Service at These Principal Oil Centers

Artesia, N. M.	Lafayette, La.	Redwater, Canada
Corpus Christi, Tex.	Midland, Tex.	San Angelo, Tex.
Dallas, Tex.	New Orleans, La.	Sidney, Nebr.
Edmonton, Canada	Odessa, Tex.	Snyder, Tex.
Farmington, N. M.	Oklahoma City, Okla.	Tulsa, Okla.
Fort Worth, Tex.	Pampa, Tex.	Wichita Falls, Tex.
Houston, Tex.		

MALONEY CRAWFORD

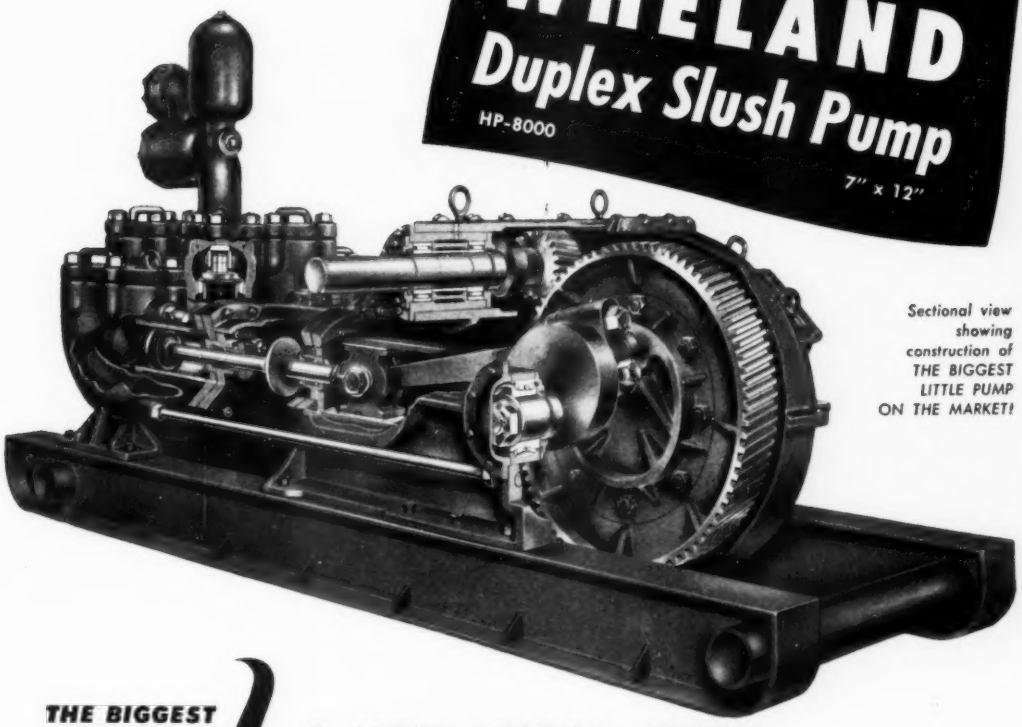
MALONEY-CRAWFORD TANK & MFG. CO.

FACTORY AND GENERAL OFFICE: 38 NORTH PEORIA—BOX 659—TULSA, OKLAHOMA
EXPORT REPRESENTATIVE: Baird Lines, 420 Lexington Avenue, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford of Canada, Ltd., Edmonton, Canada
TEXAS PANHANDLE REPRESENTATIVE: H. W. Waddell, Pampa, Texas

THE MOST ACCESSIBLE PUMP EVER BUILT!

WHELAND
Duplex Slush Pump
HP-8000

7" x 12"



Sectional view showing construction of THE BIGGEST LITTLE PUMP ON THE MARKET!

THE BIGGEST LITTLE PUMP ON THE MARKET NOW HAS

- **NEW SPIRAL GEARS**
  TAKES LESS POWER, IS SMOOTH, FREE FROM VIBRATION
- **STEEL FLUID END**
  GREATER STRENGTH WITH LESS WEIGHT. CAN BE FIELD WELDED.

Already one of the most popular pumps every built, the Wheland HP-8000 takes another step far ahead! It still has every one of the tried and true features that made it world-famous for performance and dependability. It is just as accessible, still has that outstanding lubrication system and those trouble-free bearings. It still has that exclusive Wheland tie rod construction that gives rugged strength in minimum weight. Now it is easier to run, is free from vibration and runs like a whisper . . . the steel fluid end has greater strength with less weight and can be field welded. Since so many users like the alloy iron fluid ends so well, we will continue to make them, too. Whether you prefer the alloy iron or the steel fluid end, the Wheland HP-8000 will continue to enhance its reputation as the BIGGEST little pump on the market. *Write for mechanical details.*

WHELAND

THE WHELAND COMPANY, CHATTANOOGA, TENN., U. S. A.
ROTARY DRILLING MACHINERY

DRAWWORKS • SLUSH PUMPS
ROTARIES • CROWN BLOCKS
TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS & THEIR HEADQUARTERS: Jones & Laughlin Supply Co., Tulsa, Oklahoma • Houston Oil Field Material Co., Inc., Houston, Texas Iverson Supply Co., Tulsa, Oklahoma • Lucey Products Corporation, Tulsa, Oklahoma • Superior Iron Works & Supply Co., Inc., Shreveport, Louisiana
EXPORT DISTRIBUTOR: Lucey Export Corporation, 233 Broadway, New York 7, New York — Broad Street House, London E. C. 2, England

NOW . . . McEVOY VALVES ALSO MADE IN ENGLAND

McEvoy Company has licensed Newman, Hender & Co., Ltd., well known British manufacturers, to produce McEvoy valves for sterling bloc distribution

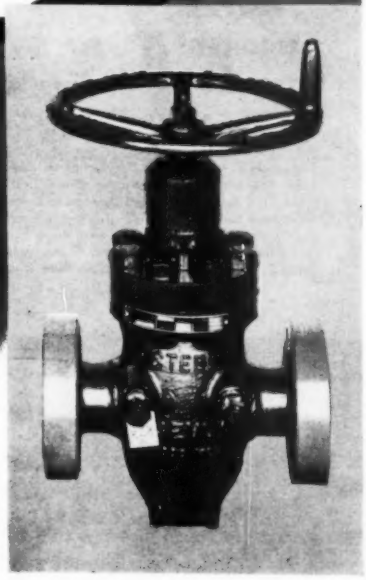
After testing all types of high pressure valves for the oil production industry, Newman, Hender & Co., Ltd., recently applied to the McEvoy Company of Houston, Texas, for rights to produce the McEvoy Gate Valve in England for sterling bloc distribution. This includes all parts of the world, excepting the United States and Canada.

Permission has been granted and, effective immediately, Newman, Hender will manufacture the complete line of McEvoy Gate Valves in their English plant.

McEvoy valves manufactured by Newman, Hender & Co., Ltd., will be called "Newman-McEvoy" valves. Those made in Houston by McEvoy will continue to be designated by the familiar McEvoy name.

Otherwise, whether made in the U. S. A. or in Great Britain, these service-tested gate valves will be absolutely identical, with all parts interchangeable.

Oil producers, particularly in remote foreign areas, will benefit by the new trade agreement in vastly extended, world-wide distribution and greatly increased availability of McEvoy Gate Valves.



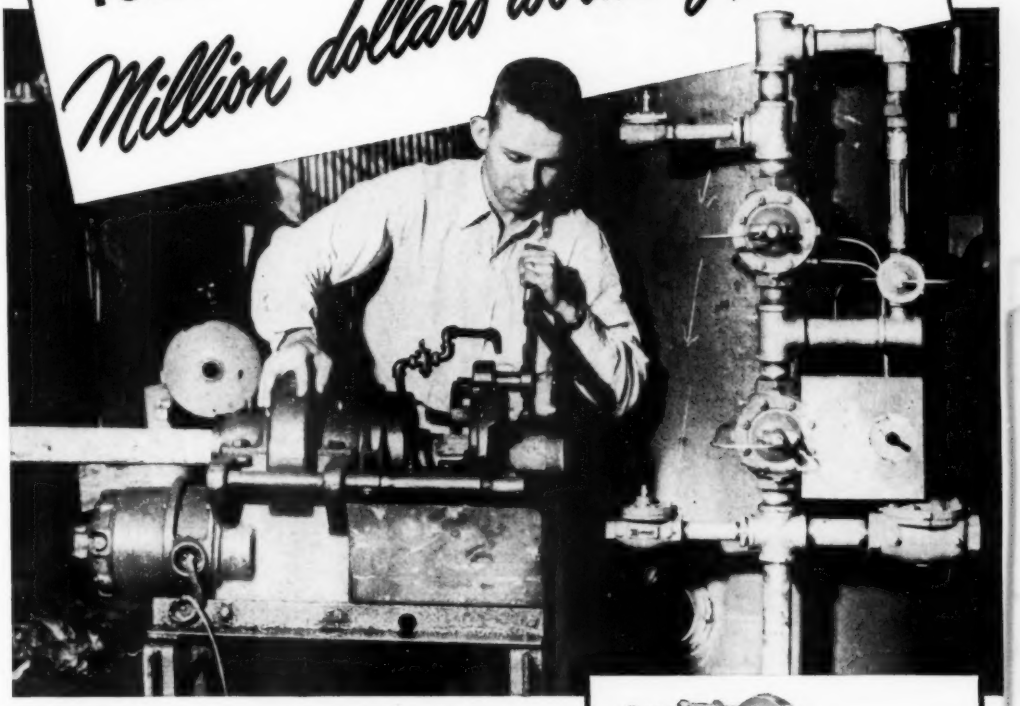
McEvoy and Newman-McEvoy Gate Valves are available everywhere in all sizes and all working pressures normally required in oil production. See Composite Catalog or write for illustrated Catalog 51.

McEvoy COMPANY

TEXAS AND MILBY ST. • P. O. BOX 3127 • HOUSTON 1, TEXAS

Export Representative: E. F. Gahan, Inc.,
Room 1223, 500 Fifth Avenue, New York, N. Y.

TOLEDO MACHINE THREADS *Million dollars' worth of pipe!*



USED 20 YEARS BY TEXAS PLANT

"We use a Toledo #999 2" Pipe Machine daily in fabrication of our water treating equipment," says E. B. Hudson, Jr., president of Hudson Water Softener Corp., San Antonio, Texas. "It has cut the threads on over a million dollars' worth of pipe since August 1931."

Mr. Hudson declares, "I know of no equipment we own that has given more satisfaction than our Toledo #999 at less operating cost."

This machine makes friends with users everywhere! *Speeds production . . . cuts costs!* Threads 2" pipe in 22 seconds . . . cuts off 2" pipe in 10 seconds. Compact . . . portable . . . efficient . . . use it anywhere in your shop, plant or on the job. Your choice—Wheel or Knife Cut-Off. Toledo-built dependability. Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

Your Choice...

Tool up *right* with TOLEDO! Hand tools, all pipe sizes, ⅛" to 12" and ¼" to 1" bolts. Power pipe machines, up to 2" and 4" capacity.

RELY ON THE LEADER

TOLEDO

PIPE TOOLS...POWER PIPE MACHINES...POWER DRIVES

No Wonder it's LUCKY!
Look what you get when you use
LANE WELLS
Radioactivity
WELL LOGGING
MEASUREMENT ACCURACY
OPERATING EXPERIENCE
ADVANCED EQUIPMENT
DEPENDABLE CURVES
You get the most complete down-hole information possible, in either cased or open hole, because of Lane-Wells unique combination of advantages. Accurate depth measurements, of course - - - Lane-Wells precision-engineered measuring system is well-known throughout the oil country. The logging is done by Lane-Wells instruments sensitive to every significant change in the formations, yet so thoroughly standardized that they give highly repeatable curves — and that means accurate, dependable curves. And lastly, in running more than 36,000 radioactivity well logs, Lane-Wells has gained unequalled experience in the operating problems and conditions of almost every active field — an invaluable aid in interpretation, particularly where local conditions may cause unusual curve responses.
Put all these advantages together, and it's no wonder so many operators say they won't complete a well without first using Lane-Wells Radioactivity Well Logging.
Tomorrow's Tools - Today!
Ask Your Lane-Wells Man!
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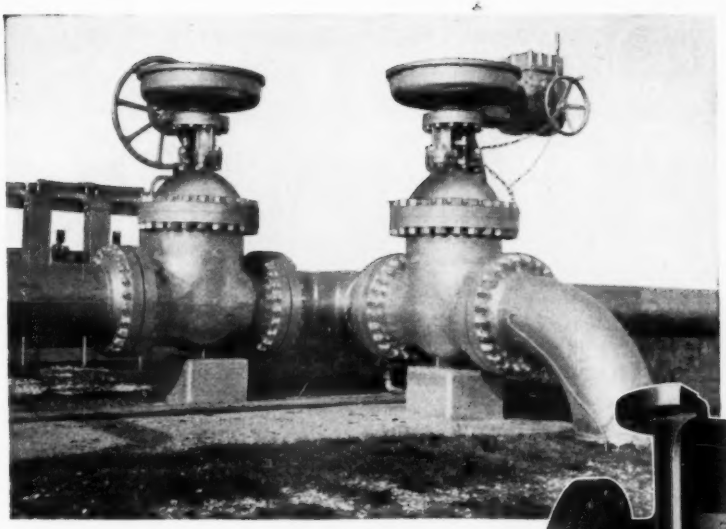
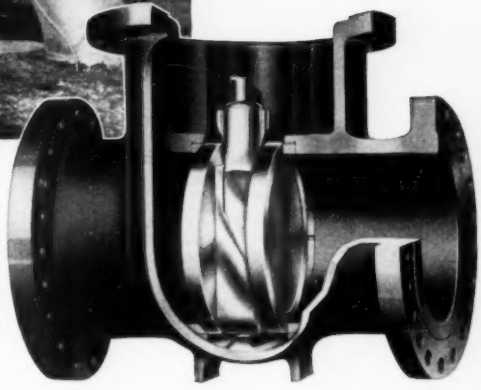


Darling 20" fully revolving double disc, parallel seat cast steel gate valves, with manually and motor-operated bevel gear, installed on a major line.



Darling cast steel pipe line gate valves

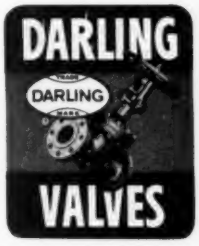
Rated tops at keeping out of trouble!

IT won't cost you a cent to find out *why* you stand to save plenty with Darling pipe line gate valves on the job. Aside from extra rugged, stress-proved construction throughout, it's Darling's unique fully revolving double disc, parallel seat principle that *really* pays off!

Take a close look at the cutaway view. The rugged, self-adjusting wedges *automatically* seat the fully revolving, no-pocket discs, assuring tight, easy closure. Coupled with uniform wear distribution, these valves do a better job and last longer with less attention, less maintenance.

If it's proof of performance you're after, check with some of Darling's pipe line users. Meanwhile, you are welcome to a descriptive bulletin giving *all* the money-saving facts. Darling gate valves are available in all pressures and various constructions for main line, gathering, manifold, tank farm and all other services.

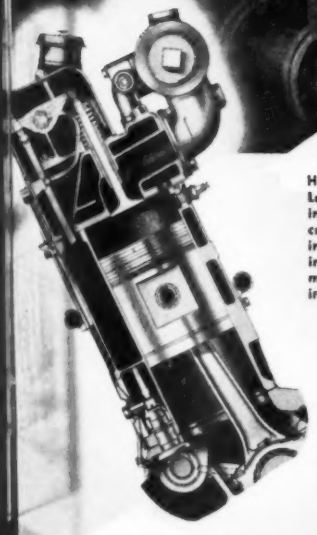
for plus values job-proved again and again



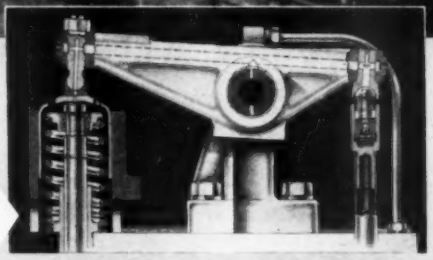
DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

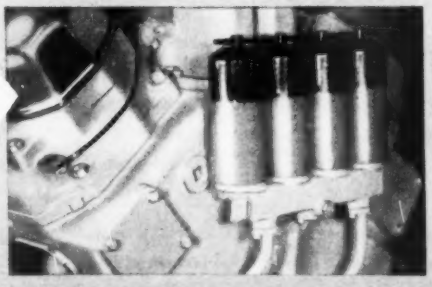
Dependable



Here's a modern pipeline installation of Le Roi 600 (max) hp L-3460 engines driving multi-stage pumps through speed increasers. Le Roi's 13 years of experience in the pipeline field was a major factor in bringing out the 600 hp L-3460 to meet the industry's need for more power in a low-cost, medium-speed engine.



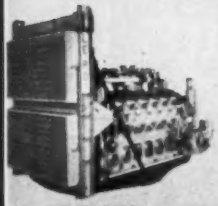
The 600 hp L-3460 is equipped with "zero-lash" hydraulic valve lifters. They eliminate tappet adjustments, increase valve life, make possible smooth, trouble-free operation.



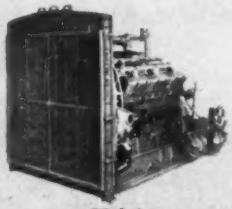
Full-flow, by-pass oil filters and coolers provide sure engine protection — still greater dependability.

Here's a cross section of an RX series engine. Note the guided valve stem mechanism and controlled water circulation around the valves that give long valve and valve-seat life. Light aluminum pistons with full-floating pins are cam-ground and tapered for precise fit, make possible faster acceleration, smoother running.

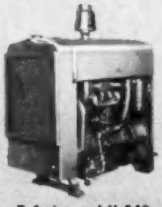
There's a Le Roi Engine for Every Oil Field Need



L-3460
HP range 280-600



RX Series
HP range 79-410



D Series and H-540
HP range 6-155

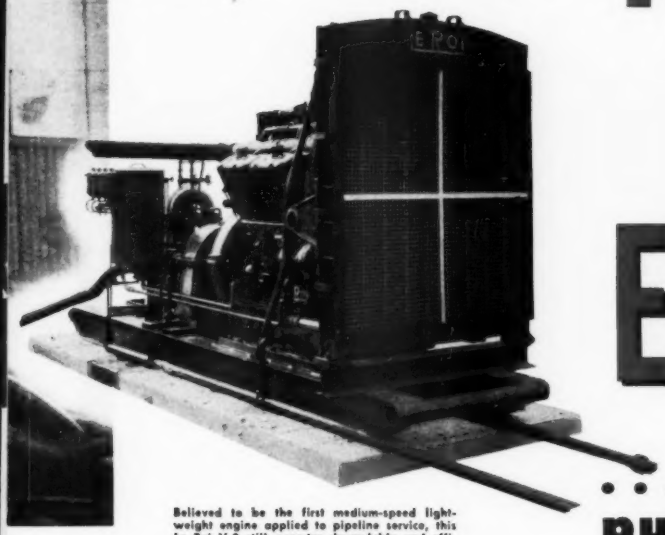
A Typical Le Roi Service Facility

Here's the efficient, well-arranged parts department of Le Roi-Rix Co.'s Long Beach branch. Two more offices — at Bakersfield and Los Angeles — are similarly equipped. All three offices maintain prompt 24-hour service. Le Roi has service facilities like these throughout the oil fields — another reason why you can depend on Le Roi.

low-cost power—

Le Roi Engines

. . . for pipeline pumping service



Believed to be the first medium-speed lightweight engine applied to pipeline service, this Le Roi V-8 still operates dependably and efficiently in a major pipeline station at Placido, Texas.

Medium-speed, lightweight Le Roi engines save money on initial investment, and maintenance

An interesting trend was started in 1938, when the Engineering Department of a major oil company decided to use medium-speed, lightweight Le Roi engines in place of conventional, slow-speed, heavyweight units on a main pipeline installation.

The choice of Le Roi was fully justified. The horsepower per dollar cost was lower. The engines were easier to service — service parts more easily obtained. And performance proved to be dependable and economical. Repeat orders followed until the pipeline project was 100% powered by Le Roi. All ten units are still giving good service.

As news of this successful installation spread Le Roi's popularity for pipeline service grew — and an ever-increasing number of Le Roi installations are being made in other fields. Yes, they're swinging to Le Roi — because Le Roi dependability and low-cost maintenance keep operating expenses to a minimum. Moreover, Le Roi engines are backed by complete service facilities in every active area.

No matter what your engine application is, it pays you to call on your nearby Le Roi distributor. He can show you Le Roi engines at work under conditions similar to yours. See why Le Roi *leads the field — in the field.*

LE ROI COMPANY

MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland • Greenwich, Ohio — Oilfield Headquarters: Tulsa, Oklahoma

P-108

LEADS THE FIELD

Le Roi Oilfield Sales

Oklahoma
Le Roi Company Branch — Tulsa
Carson Machine & Supply Co.— Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Snyder, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Illinois — Western Kentucky
Western Machinery & Engine Company—Centralia, Illinois and St. Louis, Missouri.

LE ROI

IN THE FIELD . . .

Service Network

Michigan
Hafer Engine Service — Reed City

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

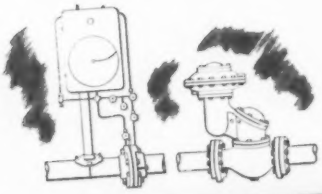
Northern Louisiana & Mississippi
Ingersoll Corporation — Shreveport, Louisiana, and Jackson, Mississippi.

West Coast
Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

SOME EASTERN SEABOARD REGIONS NOW RECEIVING NATURAL GAS THROUGH AMERICAN METER COMPANY EQUIPMENT



GREATER NEW YORK
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In the great new pipelines serving metropolitan Eastern United States, American Meter Company precision equipment plays a vital part. American instrumentation assures complete operating control, accurate records for better planning, reduction of operating costs and satisfied customers.

AMERICAN METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL OFFICES—60 EAST 42nd STREET
NEW YORK 17, N. Y.

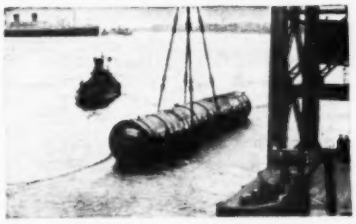
EQUIPMENT IN SERVICE

1. CBV Regulators, Pilot Spring or Weight Loaded
2. CBV Regulators, Pilot Remote Controlled
3. Orifice Meters Recording
4. Orifice Meters Integrating
5. Orifice Meters Telemetering
6. Orifice Meters Integrating Remote Counter
7. Meter Runs
8. Orifice Fittings
9. Differential Valves
10. Controllers, Pressure
11. Controllers, Flow
12. Temperature and Pressure Recorders

Yours the problem—

Harveys the answer!

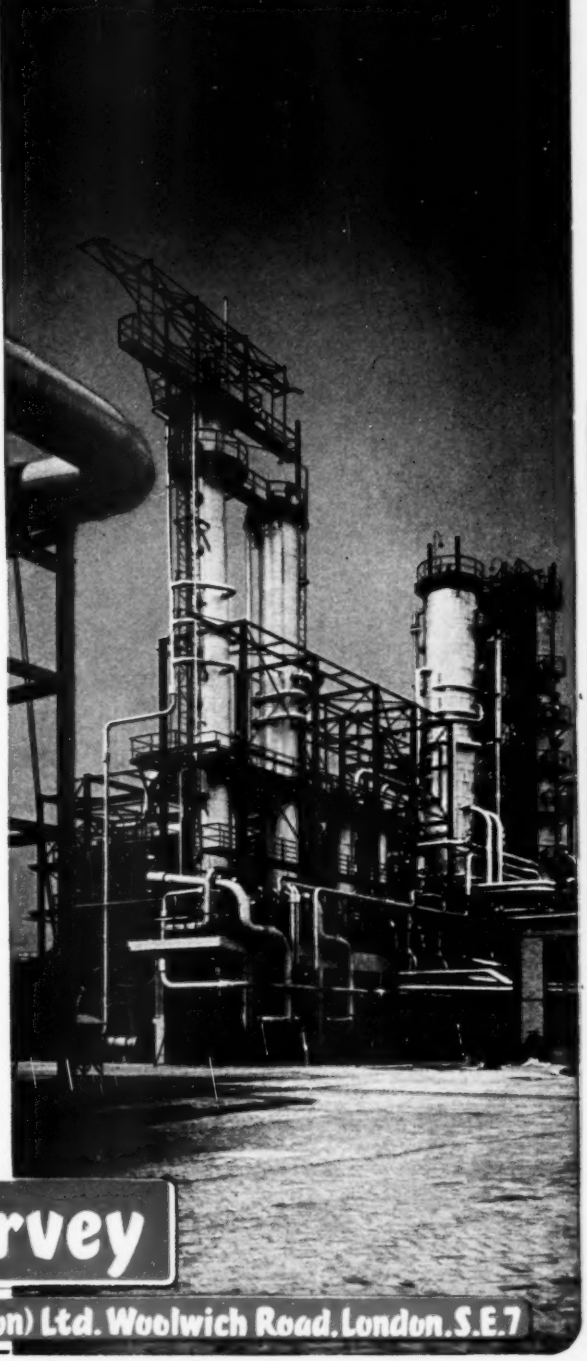
Because Harveys have one of the most modern and complete plants in the world, housing up-to-date Rolling, Bending, Pressing and Welding Equipment, operated by an experienced staff, they can supply the answer to even the most complicated plate-work problem. Typical examples of their work for the Oil Industry are shown in the accompanying photographs of Fractionating Columns supplied to the Royal Dutch Shell Group at their Pernis Refinery near Rotterdam.



A completely fabricated column is lowered into the Thames near the works—

Towed across the North Sea to Holland—

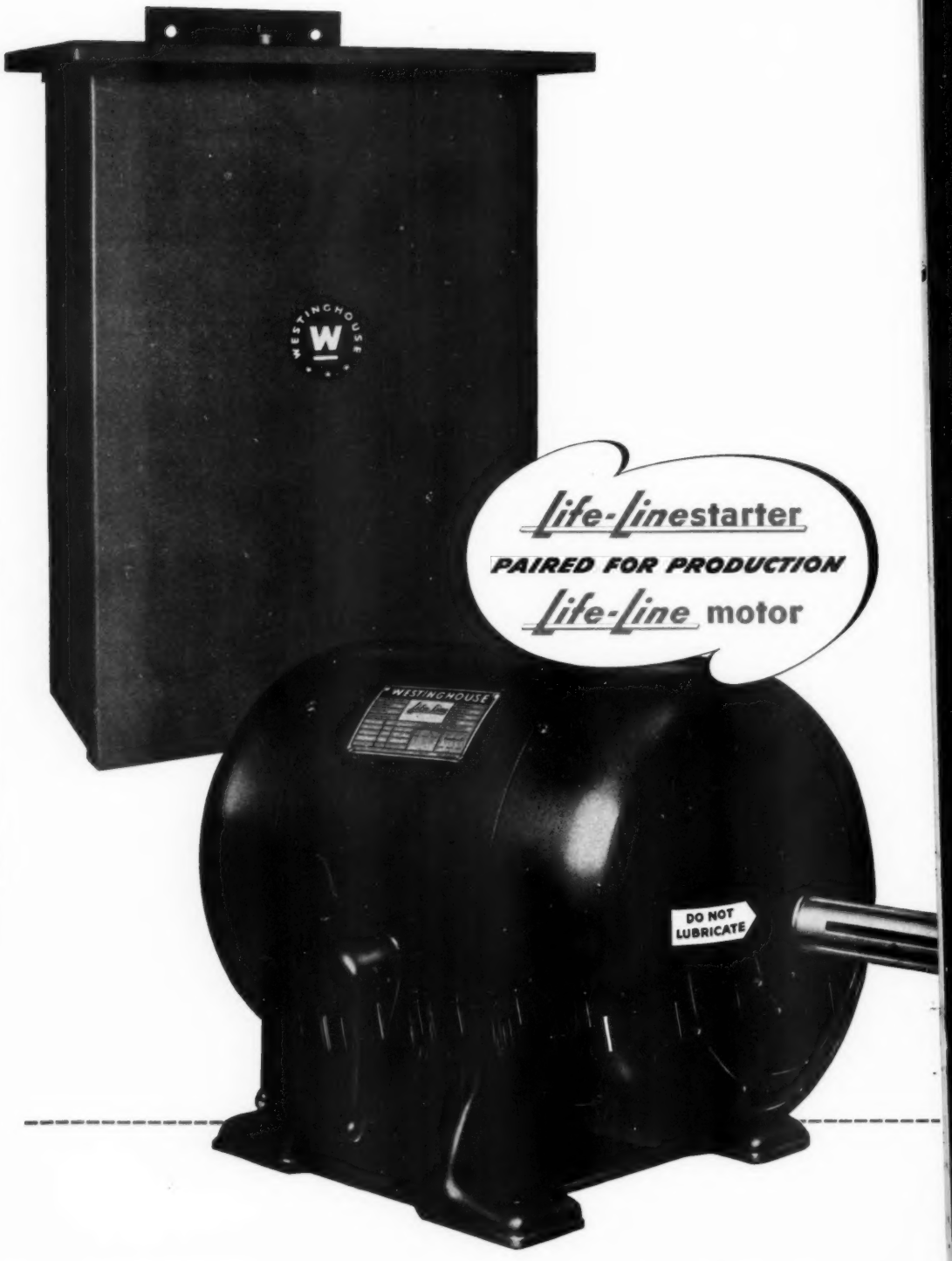
and lifted from the water at Pernis—quickly to take its part in this new Oil Refinery.



Send for Catalogue OG 750.

Harvey

G. A. Harvey & Co. (London) Ltd. Woolwich Road, London, S.E.7


WESTINGHOUSE
Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor
WESTINGHOUSE
DO NOT
LUBRICATE

Stay On-Stream longer with this protected pair

Here is a motor and control team especially built for outdoor oil well pumping service. Notice how each is extra protected to guard against rain, snow, sleet.

Look at the outer hood of the motor that gives extra protection against weather. And the controls—AB Circuit Breaker and Life-Linestarter®—are combined in one weatherproof enclosure suitable for pole mounting.

Protection against weather is part of the story. What's more, these two have the stamina to stand up to continuous pumping duty with a minimum of attention.

The Life-Linestarter is years ahead in principle of operation. Only one moving element. Nothing to stick or jam. Vibration, jars or accidental blows cannot cause false operation. Where cycle pumping is required, the built-in time switch handles the "ON" and "OFF" operations automatically. Releases pumper from making periodic trips to the well for manual switching.

You can't get a more rugged motor than the Life-Line. Its steel frame, brackets and feet can take severe shock duty imposed by pumping service. Pre-lubricated bearings need no lubrication . . . eliminate outages due to faulty lubrication.

If it's dependability you want, check these two. They're paired for performance. Ask your Westinghouse representative for copies of "Life-Line Motor Book", B-3842 and "Tomorrow's Starter Today", B-4677, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21641

YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

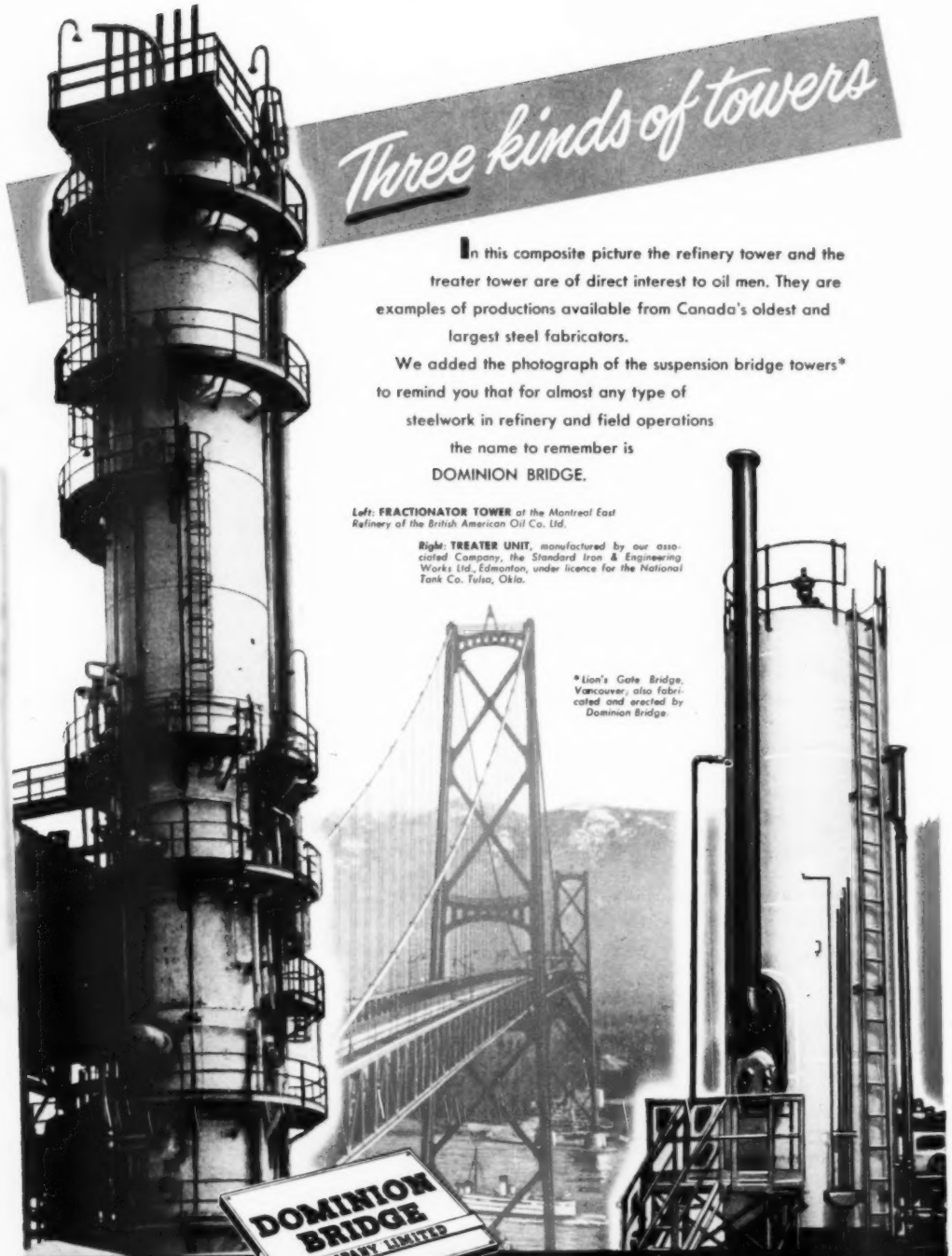
Three kinds of towers

In this composite picture the refinery tower and the treater tower are of direct interest to oil men. They are examples of productions available from Canada's oldest and largest steel fabricators.

We added the photograph of the suspension bridge towers* to remind you that for almost any type of steelwork in refinery and field operations the name to remember is DOMINION BRIDGE.

Left: **FRACTIONATOR TOWER** *at the Montreal East Refinery of the British American Oil Co. Ltd.*

Right: **TREATER UNIT**, *manufactured by our associated Company, the Standard Iron & Engineering Works Ltd., Edmonton, under licence for the National Tank Co. Tulsa, Okla.*



**Lion's Gate Bridge, Vancouver, also fabricated and erected by Dominion Bridge.*

DOMINION BRIDGE COMPANY LIMITED

Divisions: STRUCTURAL, PLATEWORK, BOILER, MECHANICAL, WAREHOUSE

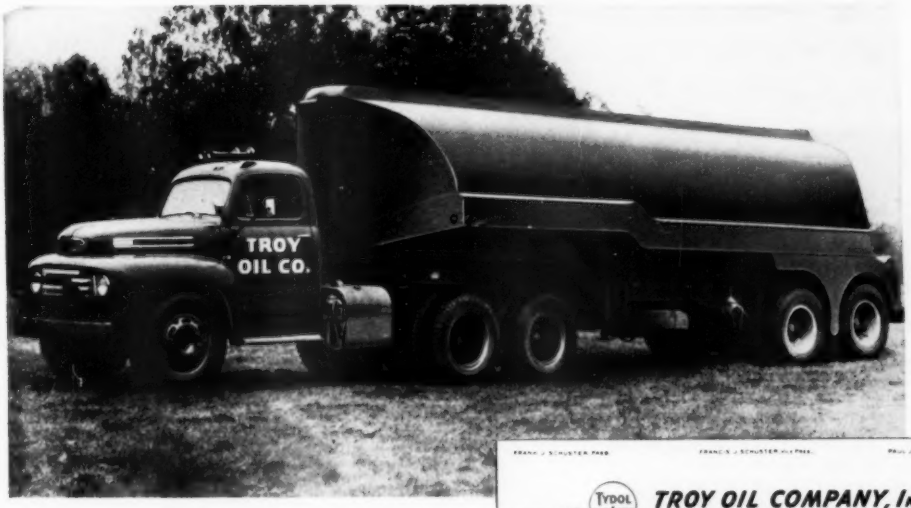
Plants at: VANCOUVER • CALGARY • WINNIPEG • TORONTO • OTTAWA • MONTREAL

Assoc. Companies at: EDMONTON • SAULT STE. MARIE • QUEBEC • AMHERST

COMPLETE SAFETY

in over 100,000 miles with

WARNER ELECTRIC BRAKES



THIS letter from the TROY OIL COMPANY is typical of the kind of brake performance you can expect on your tractor-trailer combinations—*if they're WARNER ELECTRIC brake equipped.*

For Warner Electric Brakes give you instant response, plus exceptionally smooth action with almost infinite control of the degree of applied braking power. What's more they eliminate the need for tanks, hoses and pipes and the variety of hazards to which they are subject by road and weather. Find out for yourself about the amazing economy, and the added safety of Warner Electric Brakes for your trailers. Write today to WARNER ELECTRIC BRAKE & CLUTCH CO., Dept. OGJ, Beloit, Wis.

WARNER
THE ORIGINAL AND PROVEN
ELECTRIC BRAKES
SINCE 1927

TYDOL A
VEEDOL V

TROY OIL COMPANY, INC.

February 23, 1951

Warner Electric Brake Manufacturing Company
Beloit, Wisconsin

820 E. Troy Ave.
Indianapolis 3, Indiana

Dear Sir:

Attn: Mr. G. Hickman

In our business of transporting petroleum products, dependable brakes are essential. We have units with Warner brakes on them that have travelled over 100,000 miles. We have encountered no trouble with your brakes during that period.

The enclosed photographs show the size of our units. These tankers have a capacity of 6850 gallons.

We know, from experience, that your brakes offer added safety because of the ability to synchronize the tractor brakes with the electric brakes on the trailer. Therefore, the two independent braking systems provide us with the type of braking that we have been looking for.

Yours truly,

Francis Schuster

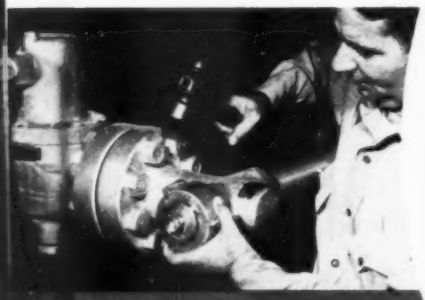
The Troy Oil Co., Inc.

Filtered Fuel Oil

Cameron

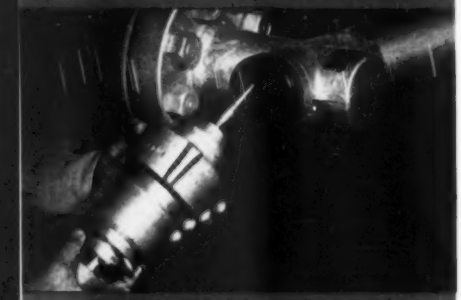
3-WAY CONVERTIBLE CHOKES

Making an ever-widening circle of satisfied customers

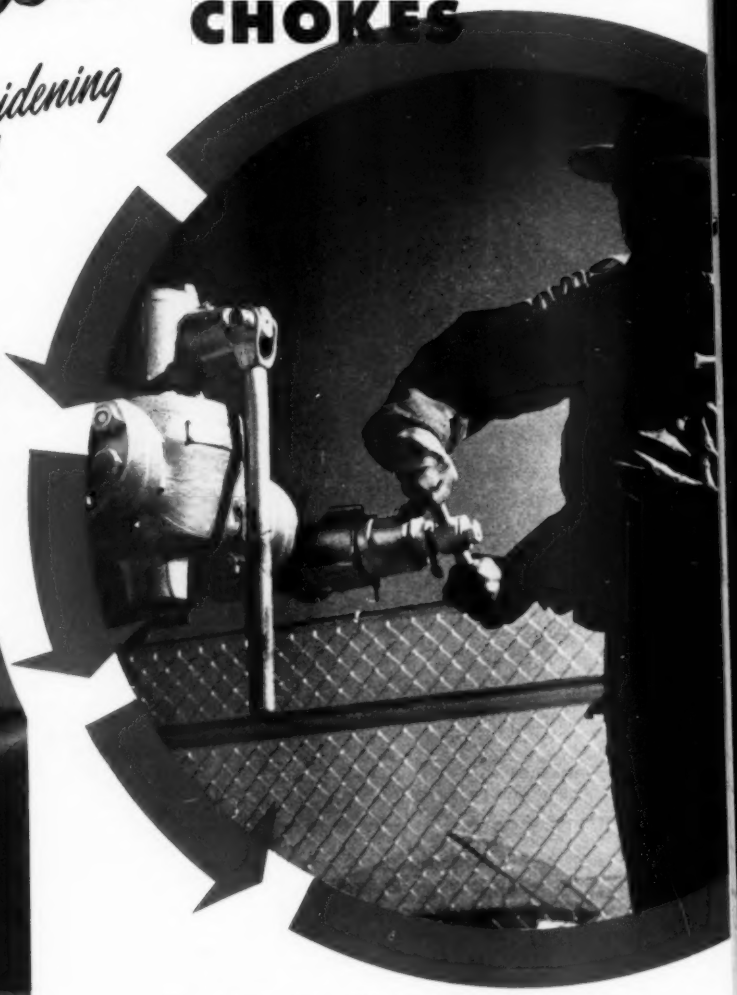


1 To change flow beans, unscrew the bonnet to loosen the connection. Trapped pressure is automatically relieved and the nut spins off.

2 Remove the bean retainer, which carries the bean in a sleeve, the sleeve being a part of the retainer.



3 The plain positive choke may be converted to a combination positive and adjustable by substituting a needle and bonnet assembly for the cap. Or, a plain adjustable choke may be had by eliminating the positive bean elements.



The Cameron Type "H" Production Choke offers a choice of three types of chokes in a single choke body: Positive, adjustable, or combination positive and adjustable. Its interchangeable parts provide maximum flexibility in arranging flow control assemblies. The body is forged steel, tee or cross type, and with threaded or API flanged connections. Needles and seats are of hardened stainless steel for extremely severe service conditions.

Cameron IRON WORKS, INC.

P. O. Box 1212 Houston, Texas

Export: 74 Trinity Place, New York

Represented in the sterling area by: British Oilfield Equipment Co., Ltd., Duke's Court, 32 Duke Street, London, S.W. 1, England.

Do all this with *One* OXWELD Trade-Mark Blowpipe

- **Cut steel up to 12 in. thick**
- **Bevel parts for fabrication or repair**
- **Gouge grooves of many sizes and contours**
- **Deseam semi-finished steel forms**
- **Cut risers and "wash" pads**
- **Prepare plate edges for welding**
- **Remove rivets and pierce holes**
- **Trim plate and structural shapes**
- **Powder-cut stainless steels and other oxidation-resistant metals**
- **Cut guided circles and straight lines**
- **Scrap obsolete equipment for profit**

Whether your work includes one or more than one of these jobs, the OXWELD C-32 Blowpipe will save you time and money. This all-purpose cutting blowpipe, with its wide variety of inexpensive nozzles and attachments, easily handles these jobs—and many others—with outstanding efficiency, speed, and convenience.

Like all OXWELD products, the C-32 is built to give you many extra years of economical and **trouble-free service** under every condition of use. Available in your choice of 3 lengths (20-, 26-, and 32-in.) and 3 head angles (75-, 90-, and 180-deg.) to suit your exact needs. Write or phone today for full information about this cutting blowpipe — or regarding welding blowpipes, regulators, cutting machines, or acetylene generators.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

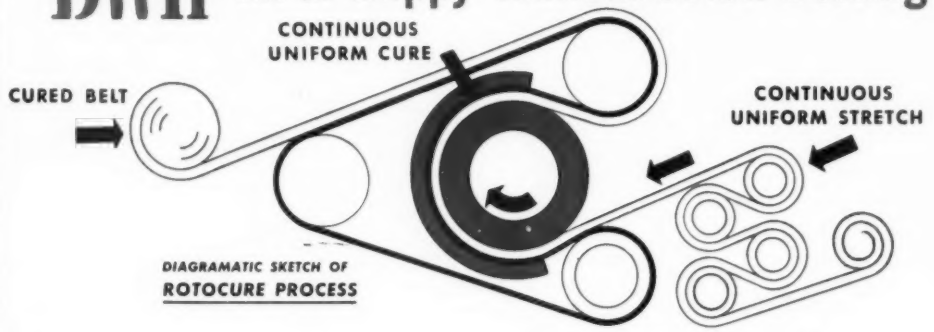
Linde Trade-Mark

LINDE AIR PRODUCTS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

ROTOCURE Eliminates this "Achilles Heel"*

*Overcured Sections which occur every 30' to 40' are a primary cause of failure in belts made by the flat press method. You won't find these "Achilles Heels" of double vulcanization in BWH Mfg. Happy Transmission & Conveyor Belting.

WITH BWH MFG. Happy Transmission Belting



DIAGRAMATIC SKETCH OF **ROTOCURE PROCESS**

Curing a small segment of rubber belting *twice* is unavoidable when belts are made under the conventional flat press method. With this "stop and go" technique, a cured segment is advanced slightly less than a press length. As vulcanization is resumed, an overcured segment results due to overlapping. This twice-cured segment is a critical section or "Achilles Heel" of about 2 to 4 inches in length and the width of the belt. It is responsible for structural weaknesses and excessive surface wear which cause early belt failure and high maintenance costs.

To solve this problem, BWH technologists pioneered the ROTOCURE process of *continuous* vulcanization whereby every *inch* of belting receives the same, *uniform* curing treatment. Here are 4 important reasons why ROTOCURE has paid off for users throughout industry, in installation after installation—by longer service life before replacement.

1. **Because there is no double vulcanization, uniform abrasion-resistant covers are always assured.**
2. **A continuous vulcanization eliminates the overlaps which can reduce flex life up to 40%.**
3. **Mechanical distortion (inherent with flat press curing at the press ends) is eliminated.**
4. **Constant uniform stretch results at all times.**

As with transmission belting — so with conveyor belting, the BWH ROTOCURE process provides all these advantages plus a higher coefficient of friction because dusting agents are not required in the manufacture with ROTOCURE.

Call in Happy or write us direct for the full story of ROTOCURE and what it can do for you in keeping transmission and conveyor belts working efficiently longer — and holding belting costs down to earth.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

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SERVING FOR.. 31 HAPPY YEARS

BWH Industrial Hose
Happy Coolers
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Safety Switches
Happy Pumping Units
Power Transmission Equipment

The HAPPY COMPANY
Formerly HAPPY BELTING COMPANY
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Salem, Illinois
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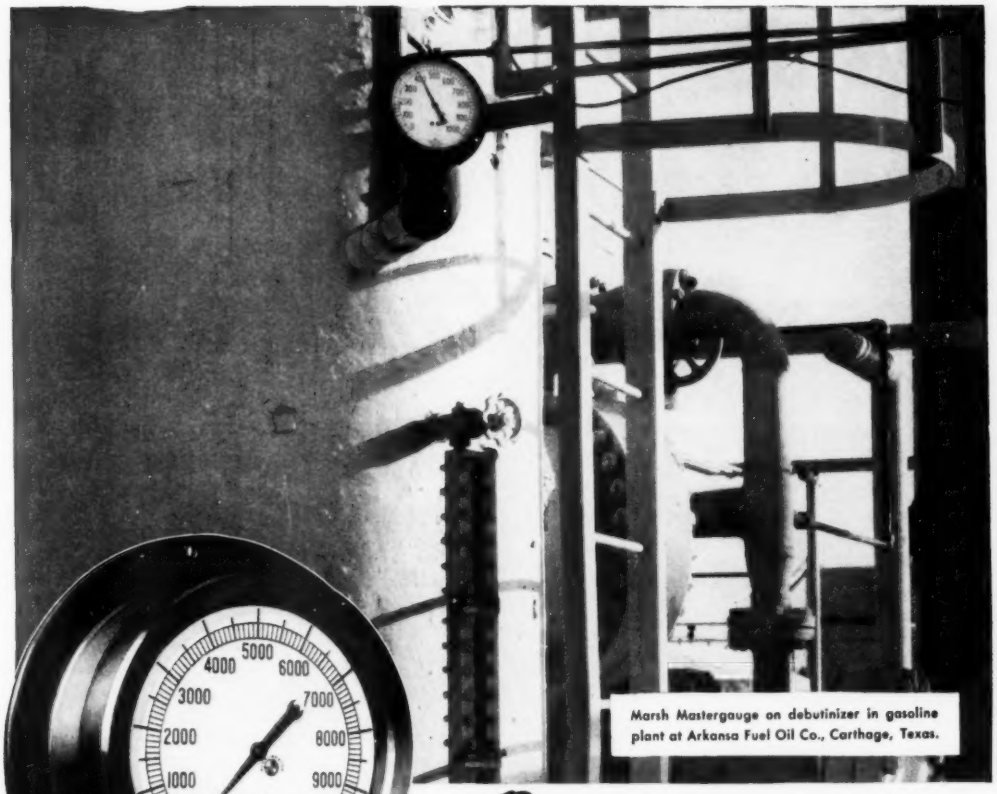


Marsh Mastergauge on debutinizer in gasoline plant at Arkansa Fuel Oil Co., Carthage, Texas.

The broad Marsh line includes gauges designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other uses in all phases of the petroleum industry.

One GAUGE YOU CAN DEPEND ON

Just put a Marsh Mastergauge to work on a tough job and you'll find there is one rugged individualist that you can depend on — *always*.

Yes, the Jas. P. Marsh family of oil industry instruments comprises a group of better gauges ideally fitted to their jobs — the Mastergauge, Christmas Tree Gauge, Oil Country Boiler Gauge, Mud Pump Gauge, Hydraulic Gauge, and so on down the formidable list.

They were bred and reared for the oil country . . . designed and developed to go beyond all former gauges in meeting the challenge of oil field conditions — conditions often more arduous than in any other branch of industry. How well they have succeeded is attested by the unprecedented growth of Marsh sales wherever there is oil.

Ask your supply store for facts about Marsh Gauges, or write for your copy of oil industry bulletin.

MARSH INSTRUMENT COMPANY

Sales affiliate of Jas. P. Marsh Corporation • **DEPT. L, SKOKIE, ILLINOIS**

★ **THE MARSH BRANCH PLANT AT HOUSTON** offers shipment from stock and facilities for repairing all makes of gauges. It is located at 1121 Rothwell Street.

MARSH STOCKED by Your Local Supply Store **GAUGES**

This Car Goes Through When Others Can't!

The 4-Wheel-Drive Willys Station Wagon, powered by the high-compression *Hurricane* Engine, assures year-around transportation over all kinds of roads. It climbs a 66 per cent grade and goes through mud, sand, snow and roadless country that stops other cars. There is room for six passengers, plus luggage, tools or equipment. The rear seats easily lift out to provide 98 cu. ft. of cargo space. See your Willys dealer for a demonstration of this remarkable car.

4-WHEEL-DRIVE WILLYS STATION WAGON

This STUD Saves You Money

The stud shown above is the Bethlehem Continuous-Thread Tap-End Stud. Put it to work where excessive strain and vibration are encountered, and it will save you money.

The Bethlehem Continuous-Thread Tap-End Stud is economical, even when used in the most difficult bolting jobs, because of the way it resists fatigue-failure. As the stud has no point of thread runout, the stress concentrations usually encountered are distributed over its entire working length, rather than being permitted to bunch up at any one point.

This stud also has two types of threads, making it ideal for installations requiring but one nut. The chamfered tap-end of the stud is threaded to Class 5 fit, and its rounded nut-end is threaded to either Class 2, 3, or 7 fit. Yet so expertly are the threads blended that we challenge you to detect the point where the change occurs.

The Bethlehem Continuous-Thread Tap-End Stud is made from carbon or alloy steel, and can be furnished heat-treated. It comes in diameters from ¼ in. to 1¼ in., and in virtually any length.

Put the Bethlehem Continuous-Thread Tap-End Stud to work, and you'll soon agree that it exceeds your highest expectations. If you'd like to have our representative call to discuss the stud in detail, please write to us at Bethlehem, Pa.

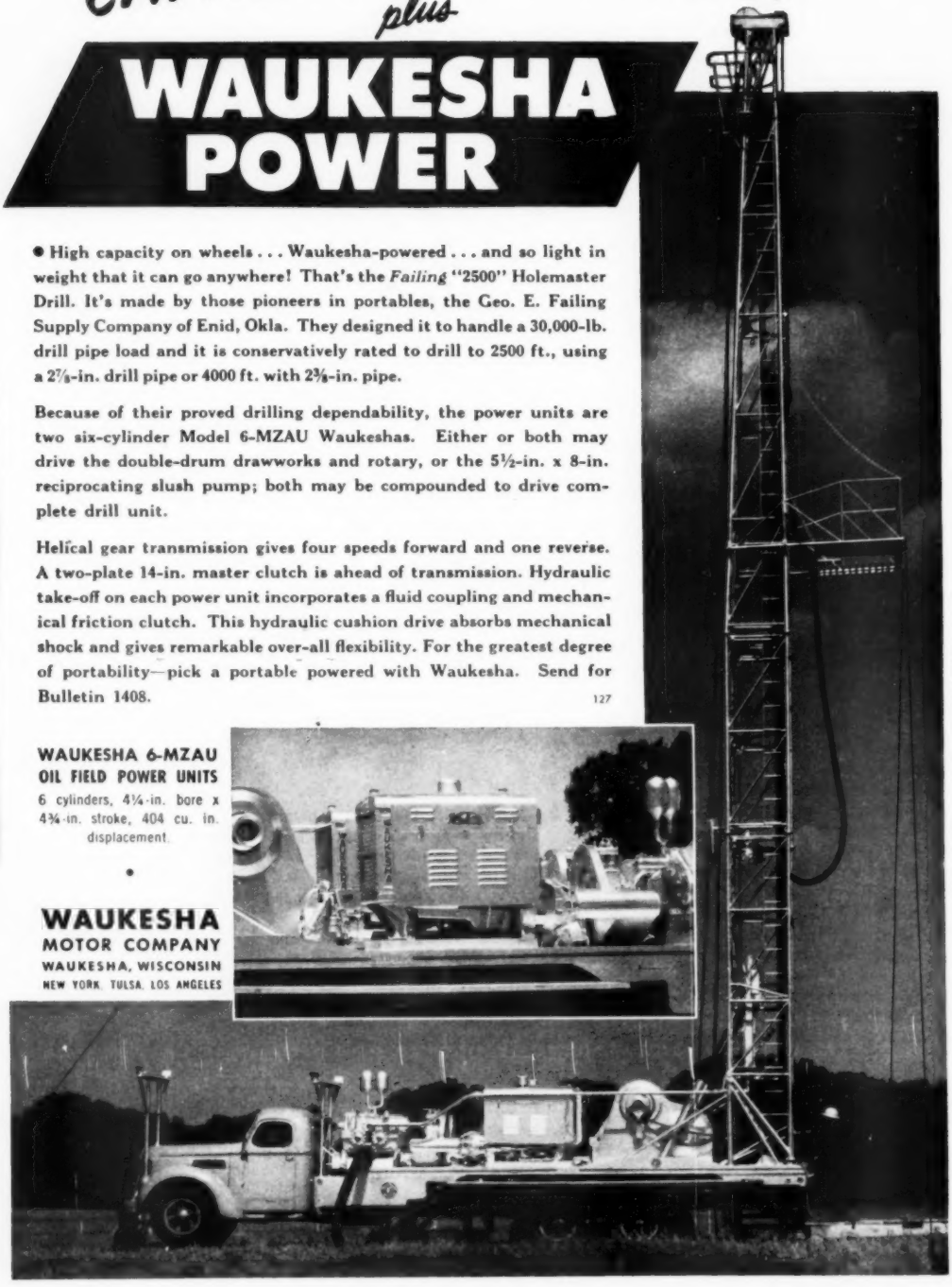
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Bethlehem supplies every type of Fastener

CAPACITY... PORTABILITY *plus* WAUKESHA POWER



● High capacity on wheels . . . Waukesha-powered . . . and so light in weight that it can go anywhere! That's the *Failing* "2500" Holemaster Drill. It's made by those pioneers in portables, the Geo. E. Failing Supply Company of Enid, Okla. They designed it to handle a 30,000-lb. drill pipe load and it is conservatively rated to drill to 2500 ft., using a 2⅞-in. drill pipe or 4000 ft. with 2⅜-in. pipe.

Because of their proved drilling dependability, the power units are two six-cylinder Model 6-MZAU Waukeshas. Either or both may drive the double-drum drawworks and rotary, or the 5½-in. x 8-in. reciprocating slush pump; both may be compounded to drive complete drill unit.

Helical gear transmission gives four speeds forward and one reverse. A two-plate 14-in. master clutch is ahead of transmission. Hydraulic take-off on each power unit incorporates a fluid coupling and mechanical friction clutch. This hydraulic cushion drive absorbs mechanical shock and gives remarkable over-all flexibility. For the greatest degree of portability—pick a portable powered with Waukesha. Send for Bulletin 1408.

127

WAUKESHA 6-MZAU OIL FIELD POWER UNITS

6 cylinders, 4¼-in. bore x 4¾-in. stroke, 404 cu. in. displacement.

●

WAUKESHA MOTOR COMPANY

WAUKESHA, WISCONSIN

NEW YORK. TULSA. LOS ANGELES

New Boiler Code Rulings permit Higher Temperatures with INCO Nickel Alloys

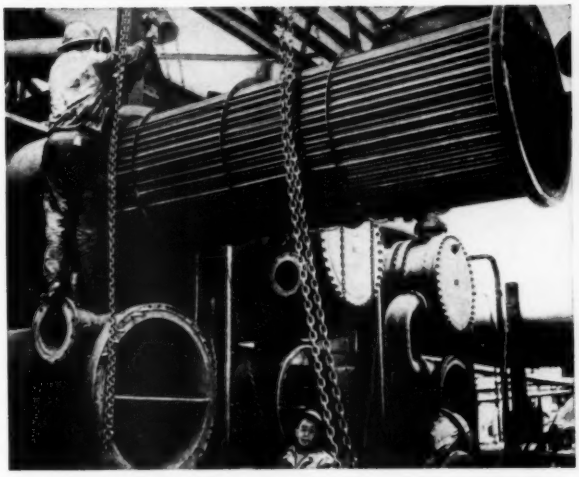
New interpretations of the A.S.M.E. Boiler Code have raised temperature limits on INCO Nickel Alloys used in the construction of unfired pressure vessels.

Also, in addition to annealed Monel, it is now permissible to use stress-relieved Monel, which has substantially higher mechanical properties.

These two modifications of the code mean that it is now possible to build stronger and lighter heat exchangers for higher temperature service, *that are insurable because they are built to code requirements.*

But this modified code applies only to physical properties. To overcome corrosion troubles, users must assume the responsibility for choosing the correct materials.

A glance at the table will show how some users have been able to get greatly increased equipment life by the proper choice of heat exchanger metals...



A cleaned exchanger tube bundle being replaced in its shell. "Spring-cleaning" like this prevents failures in service and insures efficient heat exchange. *Photo courtesy The M. W. Kellogg Co., New York, N. Y.*

To see if INCO's Corrosion Engineering Service can help you, write, outlining your problem.

And at the same time, ask for a free copy of the new "Boiler Code Interpretations Involving Nickel, Monel, Inconel." It lists the new stress and temperature limits for the INCO Nickel Alloys.

OPERATING HISTORIES OF MONEL HEAT EXCHANGER TUBING

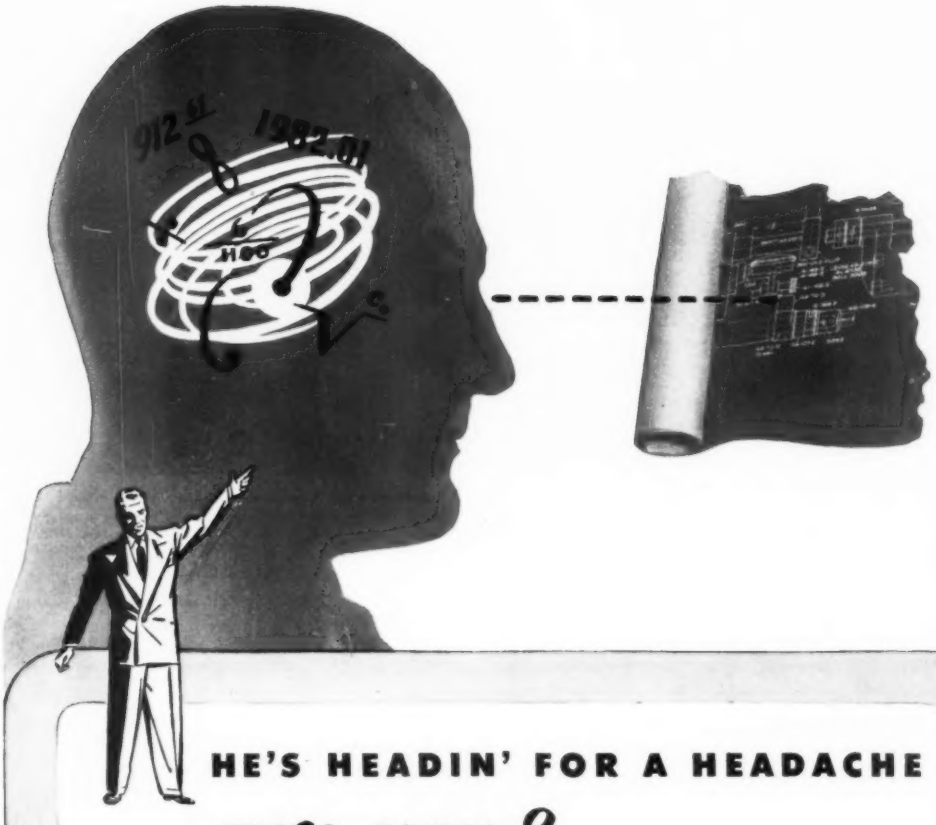
Case No.	Products Handled		Highest Temperature	Service Life		
	Inside tubes	Outside tubes		Previous Material	Monel tubes	Condition of Monel at last inspection
1	Steam	Caustic	350	2-8 weeks	17 months	Good—still in service
2	Foul Caustic	Steam	300	5 months	25 months	No evidence of corrosion
3	Heavy recycle	Straight run gasoline distillate	550	6665 hours	38,535 hours	Renewed 24 tubes after 22,000 hours—3 tubes plugged at 38,535 hours. Remainder OK.
4	Caustic soda and sodium chloride	Steam	240	10 months	80 months	Good—15 tubes replaced—weld failures
5	Crude oil	Gasoline vapor	300	6-8 months	48-60 months	No inspection

Service information on heat exchangers closely similar to yours is probably not in this table. However, help is available from INCO's Corrosion Engineering Service. From their thousands of data sheets showing corrosion rates in a wide variety of media, it is likely that an answer to your specific problem can be found.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
NICKEL INCO ALLOYS

Monel® • "R"® Monel
"K"® Monel • "KR"® Monel • "S"® Monel
Nickel • Low Carbon Nickel • Duranickel®
Inconel® • Inconel "X"®



HE'S HEADIN' FOR A HEADACHE

.....*are you?*

Nearly every design engineer has had the same experience—developed a seemingly "perfect" new machine right up to the final blue print stage only to find hidden "bugs" that spell trouble ahead.

Often these "bugs" stem from bearings—their improper or inadequate application, *THAT IS!*

Most engineers, when confronted with anti-friction problems, turn to specialists—engineers who have accumulated years of experience and "know-how" in this one field. Such is the caliber of Aetna's engineering staff. Thanks to them, leading machinery manufacturers often save months of needless time, effort and expense in product development.

If you're heading for a headache which sound anti-frictioneering can forestall, consult Aetna. Whether you require new bearings or precision parts "designed from the ground up", or merely help in selecting standard bearings, Aetna stands ready to solve your problems in the shortest possible time and at the lowest possible cost. Aetna Ball and Roller Bearing Company, 4600 Schubert Avenue, Chicago 39, Illinois.

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Precision Parts

SERVICE LEDGER
1901-1951

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UTAH OIL REFINING CO.
WASATCH OIL CO.
WOOD RIVER OIL & REFINING CO.

Avgas, rubber and anti-freeze in the raw . . . for Shell!

In 1942, Kellogg undertook its first domestic process and construction work for Shell—three Fluid catalytic crackers simultaneously—two for Wood River, Illinois, and one for Dominguez, California.

This was "matched" by an assignment to build a government-owned butadiene plant—according to designs furnished by Shell Chemical, the ultimate operator—in California. During the following years, Kellogg designed and constructed desasphalting and phenol treating units for lubricating oil production in this country. In the early thirties thermal cracking facilities were constructed in France for Shell's associate, Compagnie de Raffinage Shell-Berre.

Most recently, Kellogg has built major units for the production of ethyl chloride and for processing hexylene glycol from diacetone alcohol at the new famous Deer Park plant of Shell Chemical.

THE M. W. KELLOGG COMPANY

A SUBSIDIARY OF PULLMAN INCORPORATED

for fifty years an integral part of processing history

NEW YORK JERSEY CITY LOS ANGELES TULSA HOUSTON TORONTO LONDON PARIS

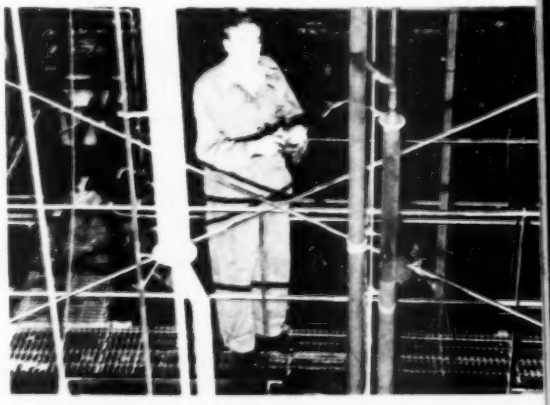
Portrait at

This year is Kellogg's fiftieth of service to industry. At this time naturally, as a group of men—known collectively to the modern business world as The M. W. Kellogg Company—we can think back nostalgically. We can remember the chimney stacks

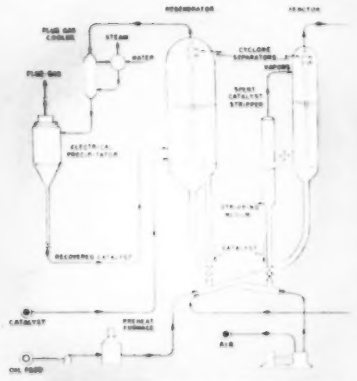
"Harnessing the Specialties..."

In previous issues of this magazine, camera "portraits" of M. W. Kellogg today have highlighted the major aspects of Kellogg's widely diversified chemical, process, metallurgical and equipment development program.

This month, development work in the specialty of chemical engineering leads logically to the introduction of the fountainhead of Kellogg's service to industry—Process Engineering.



1. *FROM THE BROAD CANVAS* of Kellogg development activity, let us turn to the specifics of chemical processing—starting with the *Chemical Engineering Development Group*. The chemical unit processes and operations are its responsibility, including heat exchange, solvent separation, diffusion and the action of fluidized solids (pictured) the latter vital to modern refinery processing.



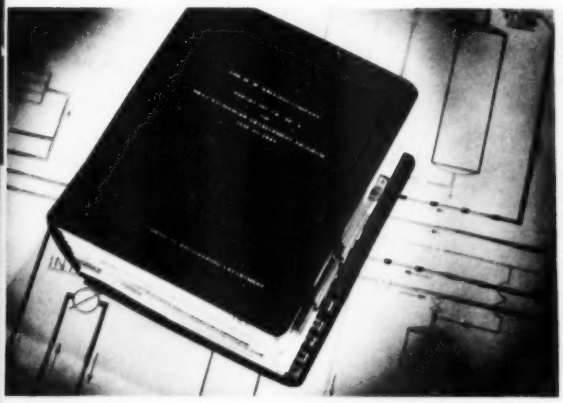
4. *BUT ALL THIS DEVELOPMENT* work has only one end purpose: More efficient processing plants, achieved either through improved processes or improved process equipment. Thus *Process Engineering* is truly the fountainhead through which Kellogg serves industry. The Process Engineering Department is made up of men of varied talents, varied experience and varied functions.

5. *FIRST TO CONTACT* any customer are those engineers charged with creating the optimum process sequence—combinations of two or more processes—to accomplish a desired industrial task. Thus, they work continually with dollars-and-cents as well as throughput, stream efficiency and product quality. These process specialists are supported in this work by a sizeable *Economics Group* which is an integral part of the department.

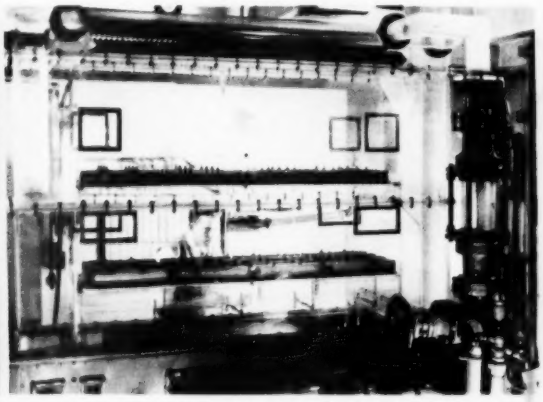
Fifty... no. 4

KELLOGG
1901 1951
50th Anniversary

we built in 1901 . . . the first crude vessels for oil refiners in the 'teens . . . our first combination unit. The forty-odd Fluid cat crackers built in these years. But, after all, The M. W. Kellogg Company is only a factor as it is able to serve industry today. For that reason, we are presenting this series of monthly camera studies which document our belief that a truly integrated organization can better serve industry to achieve greater earning power. This is No. 4 in the series.

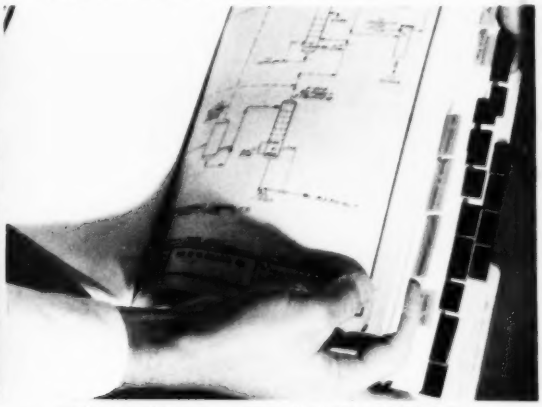


2. *THIS DEVELOPMENT GROUP* produces such volumes as the one pictured above. Some four inches thick, it documents three years' development effort by Chemical Engineering in the field of heat exchange alone, which has resulted in improved design of Kellogg heat exchangers. Similarly, the group has worked out liquid-vapor equilibrium constants for hydrocarbon mixtures under all manner of conditions.



3. *ANOTHER VALUABLE CONTINUING STUDY* by the chemical development engineers concerns the "fluidynamics" of fractionating towers, pointing toward more efficient bubble towers of all types. These studies are constantly contributing to increased tower efficiency and may soon be responsible for the design of smaller bubble towers with as great or even greater throughput than the ones in current use.

6. *THIS ECONOMICS GROUP* carries on general industry studies as well as individual studies of specific projects. Much of the stimulation of the development people for new processes comes from this group who constantly strive to perform processing functions at lower operating costs with smaller initial investments . . . and to obtain simultaneously improved yield and quality of products.



7. *BACK OF THESE* two groups are the *Process-Unit Engineers*—each group specializing in a particular process or type of processing. These engineers "live" with their particular process, devote their entire time to its improvement. These are the engineers who prepare for all Kellogg projects, the detailed process designs, flowsheets, etc., which are incorporated into Process Data Books, like the one shown here.

NEXT MONTH

. . . in the fifth in this series of camera studies of M. W. Kellogg today . . . you will see how Kellogg handles "Details by the Million" in the important phase of Design Engineering.

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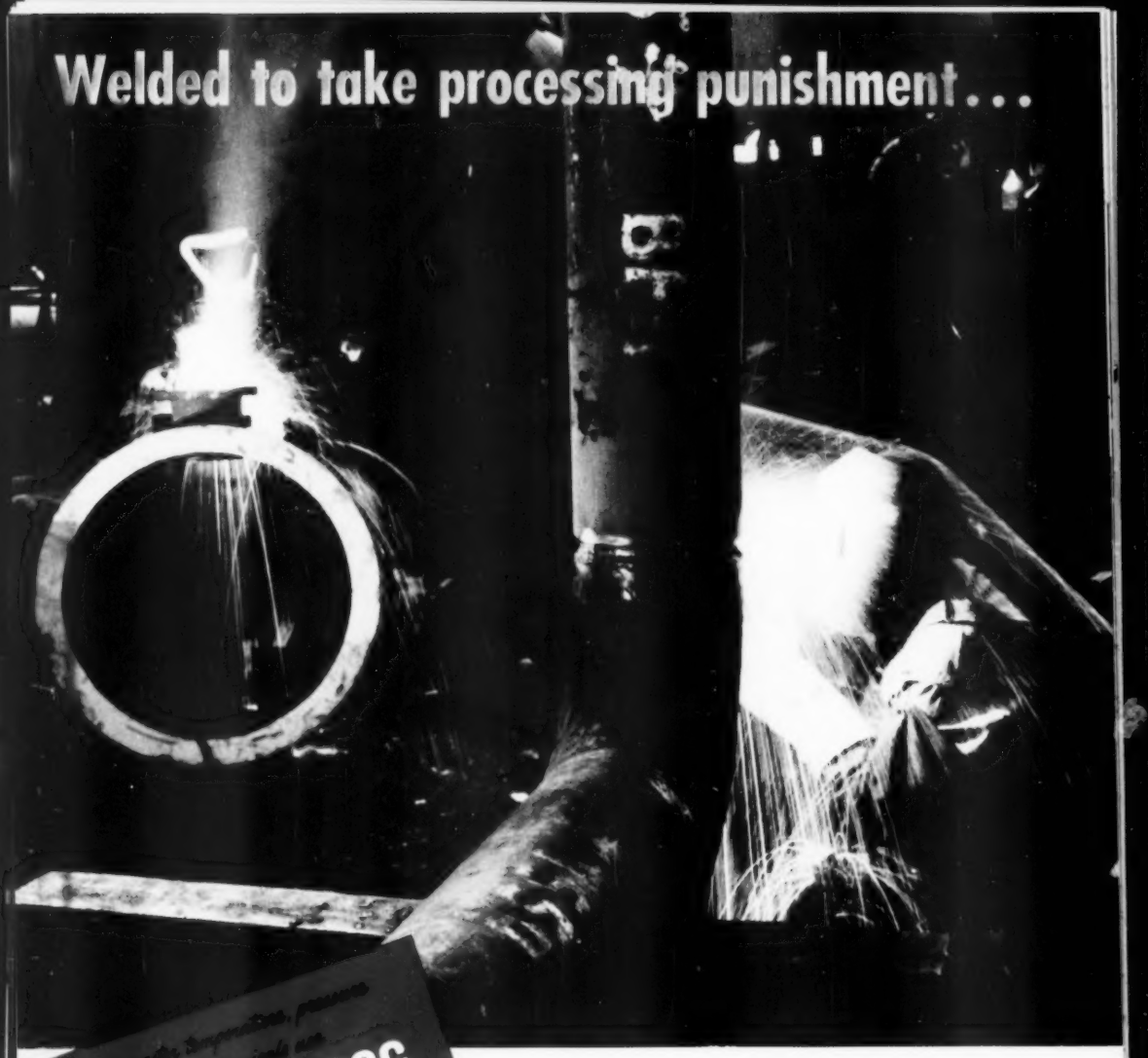

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They Say—

Problem and Solution

"It appears that, if necessary, civilian rationing of about the same relative severity as in the last war could save nearly as much additional oil as the entire amount available to Russia!

"In a long war the initial demands will be dwarfed by what would happen after a year or two of all-out building of war equipment, and particularly jet planes. . . .

"The oil-supply problem can and will be met if the Government will simply keep controls at a minimum, let us have the necessary steel and technical manpower, and not destroy the incentives which have kept the industry so vigorous that it could supply a million and a half barrels per day more products in 1951 than it did in 1949!"

Dr. Robert E. Wilson, chairman of the board, Standard Oil Co. (Ind.), addressing annual stockholders meeting.

Shelter for Coal

"Protection of the domestic oil industry from foreign oil is one thing. But to place the domestic oil industry in the position of holding an umbrella over a competing fuel industry, such as coal, is something else again. . . .

"In brief, we favor 'peril point' provisions and the mandate for 'escape clauses' which would give adequate protection against unreasonable imports to a domestic industry producing like or similar articles—not competitive articles."

R. L. Foree, president of Texas Independent Producers and Royalty Association, discussing amendments to Reciprocal Trade Agreements Act.

Another Way of Doing It

"There has been a wide split in the industry from the beginning over the economic soundness of feeding still higher octane fuels to the automobile industry's projected high-compression engines. A growing camp believes it would be uneconomic. At present octane levels, the industry has about reached the optimum of high-quality gasoline yields. Thus far all major processes to achieve still higher octane fuels decrease the yield of gasoline, while upping plant investment and cost astronomically. One oil man (T. L. Apjohn of Socony-Vacuum) estimates that to reach 96-octane fuel (composite) in a 10,000-bbl.-a-day catcracking refinery would require an additional investment of some 30 million dollars, raise energy costs 75 per cent, and cut gasoline yield 20 per cent. To move the whole industry

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- **Attains Maximum Strength.** 2500 pounds per square inch compressive strength—one hour after setting.
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up to the octane level toward which Detroit is trending (96 to 100 octane) would cost an estimated 3 billion to 4 billion dollars in specialized plants; whereas to retool all automobile engine lines, as some engineers advocate, to build radically new engines operating on new gas-saving principles would run less than 500 million dollars."

Article in Fortune magazine.

Why It Sells

"There's no mystery about this tremendous upsurge in the demand for natural gas. It is cheaper than coal or oil. So everybody wants to use it to heat his home.

"Only the regulatory commissions can give us the authority to restrict such sales of natural gas. Only the regulatory commissions can give us the authority to raise the price of natural gas to the consumer to more nearly the prices for coal and oil. The good old law of supply and demand does not function in the public-utility business. It has been replaced by man-made theories of regulation which are solely in the hands of the regulatory commissions. Our regulatory commissions should give heed to this—and to the fact that the stockholders' earnings are being counted in depreciated dollars."

Stuart M. Crocker, president, Columbia Gas System, addressing a meeting of company stockholders in Wilmington, Del.

Control or Oil?

"What the administration wants is not oil for emergency but federal control under any conditions.

"What the administration wants is the greasy fingers of federal expropriation on the lands it has seized, for instance, from the school children of Texas."

Editorial in the Dallas Morning News.

CALENDAR

May

American Institute of Electrical Engineers, District 5 meeting, Loraine Hotel, Madison, Wis., May 17-19.

Empire State Petroleum Association, Inc., Hotel Statler, Buffalo, N. Y., May 20-22.

American Petroleum Institute, conference on products-pipe-line technology, Biltmore Hotel, Atlanta, May 21-23.

Intermountain Association of Petroleum Geologists, second annual field conference, Canyon, House, and Confusion range areas of Millard County, Utah; headquarters, Forrest Hotel, Nephi, Utah; May 23-26.

Society of Exploration Geophysicists, regional meeting, Rice Hotel, Houston, May 25.

Second annual John Zink Process Heating Seminar, John Zink Co., 4401 South Peoria Avenue, Tulsa, May 26.

American Petroleum Institute, Division of Marketing, midyear meeting, Cincinnati, May 28-29.

Third World Petroleum Congress, Kurhaus, Scheveningen, the Netherlands, May 28-June 6.

American Petroleum Institute, standardi-

zation and standing committees, Division of Production, midyear meeting, Brown Palace Hotel, Denver, May 28-June 1.

Institution of Gas Engineers, London, England, May 29-June 1.

Sixth Annual Short Course in Gas Technology, sponsored by Southern Gas Association, Texas College of Arts and Industries, Kingsville, Tex., May 30-June 1.

Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont., May 31-June 1.

June

Society of Automotive Engineers, Inc., summer meeting, French Lick Springs Hotel, French Lick, Ind., June 3-8.

New York Oil Heating Association, Inc., Hotel Statler, New York, June 4.

National Oil Scouts and Landmen's Association, annual convention, Hotel Beaumont, Beaumont, Tex., June 7-9.

Rocky Mountain Oil and Gas Association, midyear meeting, Henning Hotel, Casper, Wyo., June 8-9.

Liquefied Petroleum Gas Association, Inc., first annual Mountain States district convention and trade show, Troutdale-in-the-Pines, Evergreen, Colo., June 10-12.

American Society of Mechanical Engineers, semiannual meeting, Toronto, Ont., Canada, June 11-15.

Pennsylvania Grade Crude Oil Association, 1951 annual meeting, Hotel William Penn, Pittsburgh, June 14-15.

Canadian Gas Association, Bigwin Inn, Lake of Bays, Ont., Canada, June 16-20.

Petroleum Equipment Suppliers Association, annual meeting, Chateau Frontenac, Quebec, Canada, June 17-20.

American Society for Testing Materials, annual meeting, Atlantic City, N. J., June 18-22.

Kentucky Oil and Gas Association, annual meeting, Ventura and Henry Clay hotels, Ashland, Ky., June 21-22.

American Institute of Electrical Engineers, summer general meeting, Royal York Hotel, Toronto, June 25-29.

July

Wyoming Geological Association, sixth annual field conference, Rawlins, Wyo., July 31-August 3.

August

Society of Automotive Engineers, Inc., West Coast meeting, Olympic Hotel, Seattle, August 13-15.

American Institute of Electrical Engineers, Pacific general meeting, Multnomah Hotel, Portland, Ore., August 20-23.

September

American Chemical Society, 120th national Diamond Jubilee meeting, Hotel Statler, New York City, September 3-7.

Pacific Coast Gas Association, annual convention, Fairmont Hotel, San Francisco, September 4-6.

Michigan Petroleum Association, annual fall convention, Ramona Park Hotel, Harbor Springs, Mich., September 6-7.

International Union of Pure and Applied Chemistry, sixteenth conference, Hotel Statler, New York City, September 8-9.

New York Oil Heating Association, Inc., Hotel Statler, New York City, September 10.

International Congress of Pure and Applied Chemistry, twelfth conference, Hotel Statler, New York City, September 10-13.

Instrument Society of America, Coliseum, Houston, September 10-14.

American Society of Mechanical Engineers, Industrial Instrument and Regulators division, Coliseum, Houston, September 10-14.

National Petroleum Association, Hotel Traymore, Atlantic City, September 12-14.

International Union of Pure and Applied Chemistry, sixteenth conference, Hotel Statler, Washington, D. C., September 14-15.

American Association of Oilwell Drilling Contractors, eleventh annual meeting, Texas Hotel, Fort Worth, September 21-23.

American Society of Mechanical Engineers, sixth petroleum mechanical-engineering conference, Mayo Hotel, Tulsa, September 24-26.

American Society of Mechanical Engi-

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neers, fall meeting, Radisson Hotel, Minneapolis, September 25-28.

October

American Institute of Mining and Metallurgical Engineers, petroleum branch, fall meeting, Oklahoma City, October 3-5.

California Natural Gasoline Association, twenty-sixth annual fall meeting, Ambassador Hotel, Los Angeles, October 4-5.

Texas Mid-Continent Oil and Gas Association, annual meeting, Hotel Beaumont, Beaumont, Tex., October 8-9.

American Oil Chemists' Society, fall meeting, Edgewater Beach Hotel, Chicago, October 8-10.

National Safety Council, thirty-ninth national safety congress and exposition, Stevens Hotel, Chicago, October 8-12.

Indiana Independent Petroleum Association, fall convention, Hotel Severin, Indianapolis, October 13-14.

Oil Progress Week, October 14-20.

American Petroleum Credit Association, twenty-seventh annual conference, Adolphus Hotel, Dallas, October 15-17.

American Gas Association, annual convention, Kiel Auditorium, St. Louis, October 15-17.

National Metal Congress and Exposition, American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing, Hotels Statler, Book-Cadillac, and Detroit-Leland, Detroit, October 15-19.

National Association of Corrosion Engineers, South Central Region, annual meeting, Corpus Christi, Tex., October 18-20.

Independent Petroleum Association of America, Shamrock Hotel, Houston, October 21-23.

American Institute of Electrical Engineers, fall general meeting, Hotel Cleveland, Cleveland, October 22-26.

Society of Automotive Engineers, diesel-engine division, Drake Hotel, Chicago, October 29-30.

Society of Automotive Engineers, fuels and lubricants division, Drake Hotel, Chicago, October 31-November 1.

November

American Petroleum Institute, thirty-first annual meeting, Stevens Hotel and Palmer House, Chicago, November 5-8.

Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver, November 15-17.

American Society of Mechanical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 25-30.

Twenty-third Exposition of Chemical Industries, Grand Central Palace, New York City, November 26-December 1.

December

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Chemical Specialties Manufacturers Association, thirty-eighth annual meeting, Mayflower Hotel, Washington, D. C., December 3-4.

New York Oil Heating Association, Inc., Hotel Statler, New York City, December 10.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads, first Monday of each month, Louis Sherry's, 300 Park Ave.

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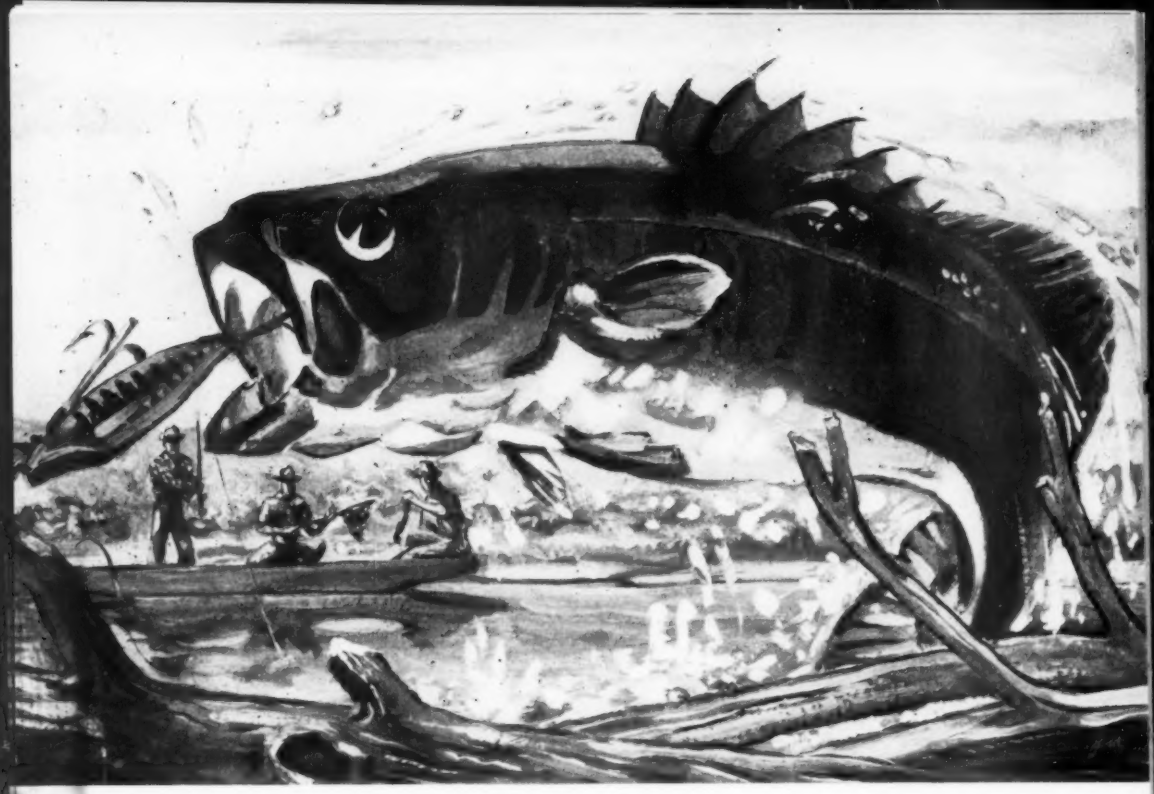

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JOURNALLY Speaking

Nothing Settled

SOME weeks back we got a press release from a major oil company announcing that wives of employes would be invited to visit the refinery "to settle the age-old question as to whether a man does as much actual work on the job as a woman does in running a household." We have been waiting ever since for a second press release giving the answer. Do you suppose that is still one of the world's great unsettled questions?

Gathering of the Clan

IF you should notice any slight deviation from the usual high standard of perfection in the reading matter in this week's issue of our favorite oil publication, please maintain silence. It's a wonder there's anything in it at all.

Last week all our editors were in Tulsa, editors from New York and Los Angeles and points in between (which includes Texas). Instead of writing copy they spent the week talking, and if you think editors write more than they talk, you're mistaken. This gang fanned the breeze plenty, and we mean it was a gang. There were 30 of us all told, home-office and district men together—which, incidentally, is quite a group of editors for any publication to have in its stable.

The boys were full of ideas to make the Big Yellow Book bigger and better, and after they got off their chests the usual gripes about how the home office mangles their deathless prose (and expense accounts), the home staff managed to give the visiting firemen a few words of editorial wisdom and enough assignments to ruin their summer vacations.

The big idea, of course, was to build up *esprit de corps*, which is a fancy foreign phrase meaning get in there and slug. Our far-flung gang of headline hunters are all good joes and self-starting reporters, but we find that they work better as a team if they are brought together now and then and allowed to hash over their mutual tribulations and triumphs. Then we all put our feet under a table and quaffed the cup that cheers but not inebriates (this is Oklahoma), and a jolly good time was had by all.

Out of the whole clambake came a lot of constructive ideas which (if all promises and good intentions are kept) will result in giving you readers a lot better service for many months to come. Which should make up for the fact that the boys were pretty much out of production last week.

News With Meals

OUT in Midland, Tex., where oil men are hungry for food and information, an enterprising cafe is building up a big business catering to the first want by also serving the second. Alongside the coffee urn it has a big bulletin board where oil men post notes to each other, notices of jobs and help wanted, and other information for mutual exchange or general dissemination. It has proved to be very popular, and the next best thing to reading the Big Yellow Book. That's the way we got our start—by giving oil men information they want—and look at us now.

Good Gamble

LAW-ENFORCEMENT authorities in Texas have announced that they intend to keep gamblers out of the oil business in their state. Let's get this straight. As we understand it, there is bad gambling and good gambling. If the officials confine their embargo to the gangster brand of gamblers, that's fine. But we hope they don't succeed in taking all the gamble out of the business of finding oil. There would not be much fun if finding oil were reduced to an exact science.

Atomically Speaking

ACCORDING to the National Geographic Society, which disseminates the darndest miscellany of odd information, Great Britain's first two atomic piles were nicknamed Gleep and Bepo, Canada's first nuclear reactor was called Zeep, and France has a laboratory atomic pile designated Zoe. We thought oil men were the world's champions at thinking up strange names for their equipment, but it looks as though the atomic age may surpass them.

Henry D. Ralph.

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the OIL AND GAS JOURNAL

May 17, 1951
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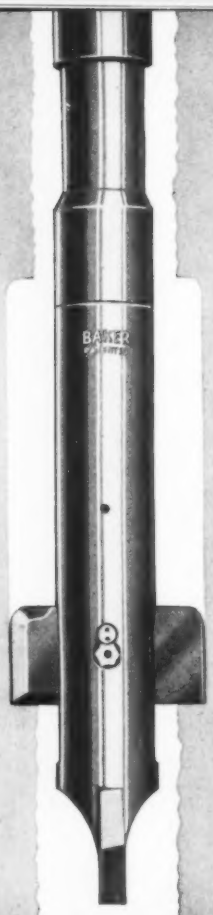

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. . . no other tool is equal to the BAKER ROTARY WALL SCRAPER.— When it is desirable to enlarge the diameter of an open hole to an extent considerably greater than the diameter of the casing, you can depend upon this strong, safe Wall Scraper with blades which open positively when pump pressure is applied. The uncased hole *can be enlarged at any point,* and by changing to progressively larger sizes of blades, an amazingly increased diameter can be secured. Example: No. 6 size Scraper can be run safely through 9⅝" API casing, then will ream from a minimum of 9¼ inches to maximum of 19 inches by changing to increasingly larger sizes of blades.

RUGGED BLADES CLOSE SAFELY

Baker Wall Scraper blades have extra-long vertical cutting edges which prevent any tendency to "corkscrew" and insure scraping the maximum footage of full-gauge hole. And, when the Scraper is to be removed from the hole, pumps are shut down and a strong spring aids in closing blades into body. These blades are made from alloy steel forgings, and their cutting surfaces are hardfaced and set with tungsten carbide inserts to insure long cutting life.

MANY IMPORTANT USES

THE BAKER ROTARY WALL SCRAPER is extremely versatile and is successfully and economically used for many worthwhile applications, a few of which are shown below. It will pay you to learn all about the Baker Rotary Wall Scraper (Product No. 500-D) from your BAKER (or Composite) CATALOG, or better yet, ask the Baker representative in your area for helpful suggestions as to how this efficient tool will fit right into your drilling program.

BAKER

ROTARY HYDRAULIC EXPANSION

WALL SCRAPER

PRODUCT NO. 500-D

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

These typical uses illustrate a few of the many worthwhile applications of the Baker Rotary Wall Scraper.

Figure 1—WATER SHUT-OFF TESTS are made after rat-holing below the shoe, "wall scraping" for a vertical distance of 5 feet or more to the gauge of the original hole (or slightly beyond). Figure 2—ENLARGING HOLE TO SET CASING OR LINER with maximum ease and safety. Figure 3—REMOVING MUD SHEATH from the face of the formation to permit cement to bond with original formation. This same procedure is used to scrape the face of the oil sand to increase production. Figure 4—BOTTLENECKING to insure complete encasement of the shoe joint with cement; also to minimize hazard of channeling at this vital point. Figure 5—ENLARGING HOLE FOR C.P. JOB—showing "bottlenecked" section with casing or liner serving as water string above, and oil string below, the cementing point. Figure 6—GRAVEL PACKING is easily and effectively performed when the hole has been enlarged with a Baker Rotary Wall Scraper.

BAKER

OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

Ahead for L.P.G.

A new supply of liquid fuel equal to a large new oil field or a large new refinery will be provided this year in the anticipated increase in production of liquefied petroleum gas. This is the estimate of speakers at the A.P.I. refinery meeting, where a careful analysis was made of the growth trend of this branch of the industry.

Potentially, our crude-oil and natural-gas reserves could yield almost as much propane and butane as motor gasoline, though only about one-quarter of the potential is being utilized at present. Complete utilization depends, of course, on a wider market. There are several major markets for L.P.G., and all of them are growing rapidly.

However, the fastest-growing market at present, and the one with the greatest possibilities for still faster and unlimited growth, is the internal-combustion engine. In many areas L.P.G. has proved more economical than gasoline in tractors, stationary engines, and intracity buses, with only minor adaptations of the motors and carburetors.

But high-compression engines designed specifically to take the fullest advantage of L.P.G. offer a marked economy in fuel costs, and under some conditions L.P.G. is competitive with diesel fuels. This situation almost certainly portends a rapid increase in the use of this fuel for mobile power.

The chief limiting factor in the growth of this and most other uses of L.P.G. is the problem of distribution and storage. Many uses are seasonal, but distributors generally have not installed sufficient storage to permit a year-round inflow of product, with the result that a heavy strain is put on transportation facilities during peak periods and producers are plagued with lack of market during slack seasons.

This problem is being tackled vigorously in several ways. One of the most promising developments is underground storage, such as in a water sand or a reservoir washed out of a salt dome. This type of storage, of course, depends on locating the right sort of underground conditions, but an active search is in progress. With the industry now convinced that more storage is the key to stable production and satisfactory distribution, it is probable that this problem will be overcome before long.

In recent years the sale of L.P.G. has been increasing by about 25 per cent every year, until this fuel has become a vital part of the nation's energy resources. A few more years of such growth will put it up in the top rank of fuels. If, as seems likely, the bulk of the future growth is as a motor fuel, L.P.G. may soon be serving a sizable portion of this market.

A few years ago this prospect might have been viewed with alarm by refiners, but with the automotive market expanding so rapidly, and with the defense program imposing such burdens on the entire petroleum industry, this potential utilization of such a large portion of the nation's hydrocarbon reserves should be viewed as a highly desirable trend.

THIS WEEK

EXPLORATION—Frank Morgan tells West Coast group oil industry will have to look where others may think there is no oil if national requirements for new reserves are met. . . . ¶Shell Oil Co. to begin drilling soon on eastern Montana wildcat on Baker-Glendive anticline, southwest of Amerada's North Dakota discovery. . . . ¶Amerada announces plans for additional wells on Nesson anticline in Williston basin. . . .

INTERNATIONAL—Study of foreign refining plans indicates capacity of 5,048,000 bbl. daily by end of 1953, compared with present capacity of 4,145,000 bbl. . . . ¶Iran declines to negotiate settlement with Britain over Anglo-Iranian seizure. . . . Britain alerts regiment of troops for possible emergency duty. . . . ¶Pemex preparing to spud in on rank wildcat in Lower California. . . . Equipment being moved in for wildcat on Pauley concession near Reynosa. . . . ¶Bolivia opens government lands in interior to joint-company operations in bid for foreign oil capital. . . .

ACTIVITY—Crude production averaged 6,107,200 bbl. daily for week ended May 12, a decrease of 625 bbl. daily for the week. . . . ¶Total completions increased 27 wells to 810. . . . Wildcat completions totaled 195 wells compared with 200 for previous week and 144 for same week last year. . . . ¶Rotary rigs operating in United States on May 7 increased to 2,402, only 5 rigs less than the all-time high set last December. . . .

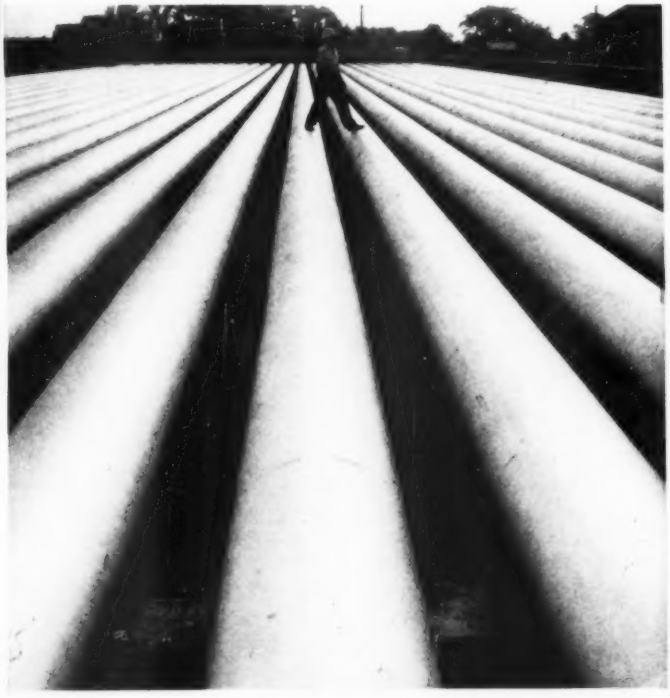
TRENDS—Indicated demand at refineries for four major products in 4-week period ended May 5 was 7.8 per cent greater than in same weeks last year. . . . Residual fuel increased 13.3 per cent. . . . Gasoline and distillate increased 6.5 per cent. . . . Kerosine increased 3.4 per cent.

TECHNOLOGY—Union Oil Co. announces development of new catalytic cracking process to hydrogenate and desulfurize heavy charge stocks. . . . Company planning installation of commercial unit at Wilmington refinery. . . . ¶Carbide & Carbon Chemicals Co. to enlarge plant using new process to make acetylene. . . . ¶Process produces acetylene through partial oxidation in a high-temperature reaction of methane and oxygen. . . .

PRODUCTION—Shell buys 32 producing wells in South Mountain area near Santa Paula. . . . Announces plans for additional development of properties. . . . ¶Bureau of Mines engineers question theory of uniform characteristics of reservoir oil as result of 8-year study of Elk Basin field. . . . ¶Tevis Morrow buys 29 producers from three oil companies in California's Placerita Canyon field.

REFINING—Continental Oil Co. announces plans for a $23,000,000 expansion program at Westlake refinery near Baton Rouge. . . . Project expected to treble refinery's current capacity of 11,000 bbl. per day. . . . ¶New process combining high-vacuum distillation and vis-breaking for recovery of heavy fractions from crude residuum described before A.I.Ch.E. meeting in Kansas City. . . . ¶Standard Oil Co. (Ind.) to boost capacity of Sugar Creek, Mo., refinery from 38,000 to 68,900 bbl. daily this year and next.

PIPE LINES—Texas Ohio Gas Co. formed to construct 30-in. gas line from Gulf Coast to Appalachian area. . . . Incorporators say line would have capacity of 500,000,000 cu. ft. . . . No plans for financing or source of gas disclosed. . . . ¶Plantation Pipe Line Co. announces plans to double number of compressor stations on 707-mile line paralleling products line from Baton Rouge to Charlotte. . . .



L.P.G. STORAGE.—During the war, emergency storage for L.P.G. was often improvised from line pipe, as in this view at Ontario, Canada. The continued rapid growth in L.P.G. output and prospects for even wider markets emphasize the need for more storage and distribution facilities and an intensive program is under way to develop underground storage utilizing natural reservoirs instead of steel.

Williston Basin Test

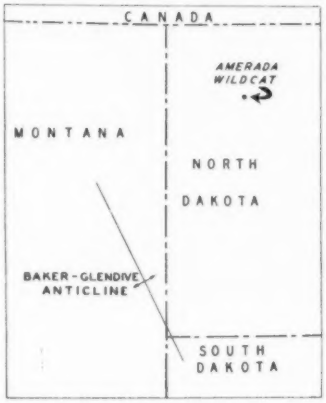
Shell schedules rank wildcat on Baker-Glendive anticline in eastern Montana; Rickey area test already under way

SHELL OIL CO. last week announced plans to start a deep test by July 10 in the Pine area on the Baker-Glendive anticline of eastern Montana. The area is on the west rim of the Williston basin.

The well is scheduled to test Mississippian and Ordovician formations. The announcement followed approval by the United States Geological Survey of the unitization of 45,910 acres covering the prospect.

Shell already has started field work on another deep test in the Rickey area of northwestern Dawson County, which lies northwest of the Pine area. *(See The Oil and Gas Journal, May 3, page 68.)*

On the east flank of the Baker-Glendive anticline, Continental Oil Co. has recorded a block of leases in 10n-61e, eastern Fallon County, Montana, adjoining the North Dakota state boundary line.



Map showing location of Baker-Glendive anticline on which Shell test will be drilled.

Baker-Glendive anticline.—The Shell wildcat at Pine is related to one of the most outstanding tectonic features of the Williston basin. The axis of this asymmetrical anticline extends in nearly a straight line for a distance of more than 115 miles in a northwest-southeast direction across Dawson, Wibaux, and Fallon counties in eastern Montana into Bowman County in southwestern North Dakota, and to Harding County in the northwest corner of South Dakota.

First described in 1910 by W. R. Calvert, the feature, then known as the Cedar Creek structure, was mentioned as "a strongly pronounced anticline (which) extends from Yellowstone River near the mouth of Cedar Creek southeast for about 70 miles into the Dakotas."

The fold overlies a fault scarp in the pre-Cambrian basement complex. It is generally related to a series of en-echelon folds and faults extending northward from Black Hills uplift and lies roughly parallel to the Cordilleran boundary.

Shallow gas fields.—Along the axis of the anticline, several shallow gas fields have been developed in a series of thin, lenticular, shaly sands on a series of low-relief domes. The first gas field, Gas City, was found in 1915. The largest gas wells were found on the Ash Creek dome, ranging from 7 to 25 million cubic feet in open-flow capacity; other gas-productive shallow domes include Little Beaver, Cabin Creek, and Baker.

Gas was found at depths of about 800 ft. in the Judith River and 1,500 ft. in the Eagle sandstone. Both reservoirs lie in the Upper Cretaceous system.

Paleozoic oil.—A total of 28,144 bbl. of 29.5°-gravity crude oil has been produced from two deep wells drilled since 1936 on the Baker-Glendive anticline. Altogether, four deep tests have been drilled on the anticline to the Mississippian and Ordovician rocks; three were on Little Beaver dome and one on Baker dome.

On Little Beaver dome, west of the North Dakota boundary line, Montana-Dakota Utilities Co., in August 1936 discovered black oil from a depth of 8,130 ft. in the lower Paleozoic rocks at its 1 Northern Pacific R.R. test in 17-4n-62e.

The second deep test was drilled 25 miles to the northwest on the Baker closure by same operators 1 Warren, Section 23-8n-58e, but it found no commercial production in drilling to a total depth of 7,360 ft. The third deep well was drilled back at Little Beaver dome by Montana-Dakota at 1 Smith, only 3,000 ft. north of 1 Northern Pacific but in 8-4n-62e. The Smith well produced some black oil and much water from a total depth of 6,853 ft.

Carter Oil Co. reworked the Little Beaver dome and drilled a deep dry hole during 1941 at 1 Northern Pacific, C SW NE 19-4n-62e, about 2 miles southwest of Montana-Dakota 1 Northern Pacific discovery; the Carter well found porosity and black oil saturation from 6,815-25 ft. in the upper part of the Madison (Pahasapa of the Black Hills) but was abandoned as dry after drilling to a total depth of 9,680 ft. in pre-Cambrian amphibolite. Cambrian sediments penetrated just above the amphibolite comprised 219 ft. of Deadwood sandstone with some interbedded dolomite and green shale.

Discovery to Be Developed

Plans for early development of the Nesson anticline holdings of Amerada Petroleum Corp. in northwestern North Dakota were revealed by company officials here this week.

Several wells will be drilled this summer in the vicinity of the 1 Clarence Iverson well near Tioga in eastern Williams County which produced for several weeks from 11,630-660 ft. Currently, the Iverson well is attempting to clear up a fishing job preparatory to drilling deeper from 11,744 ft.

Amerada has under lease in excess of 300,000 acres in the Nesson anticline on which the Iverson well is situated. In addition, Amerada has an additional 1,500,000 acres under lease in the Williston basin area.

Uniformity Theory Questioned

WASHINGTON.—Widely held theories that the physical characteristics of petroleum are uniform throughout a given reservoir and that every underground accumulation of oil and gas is in a state of equilibrium are questioned by Bureau of Mines engineers in a report on Elk Basin field in Wyoming and Montana.

On the basis of long-term tests conducted at the petroleum and oil-shale experiment station at Laramie, Ralph H. Espach, chief of the petroleum and natural gas branch for Region IV, and Joseph Fry, petroleum engineer, reported that the physical properties of oil taken from various wells in the Tensleep sandstone formation differ widely. The studies were started in 1943.

The data obtained showed such wide variations as a saturation pressure of 1,250 psi. and 490 cu. ft. of gas in solution in a barrel of oil at the crest of the structure, contrasted with a saturation pressure of 530 psi. and 134 cu. ft. of gas in solution in a barrel of oil low on the flanks.

The station's work and results are detailed in Report of Investigations 4768, "Variable Characteristics of the Oil in the Tensleep Sandstone Reservoir, Elk Basin Field, Wyoming and Montana," copies of which may be obtained without charge from the Bureau of Mines publications distribution section, 4800 Forbes Street, Pittsburgh 13.

SPECIAL CITATIONS.—Three West Coast oil men received "Citations for Service" at the Los Angeles A.P.I. meeting. They were presented by J. C. Donnell II, second from left, president of Ohio Oil Co. and A.P.I. vice president in charge of production. Award recipients were C. R. Ball, left, of Ball & Black Supply Co., for work as arrangements chairman for the 1951 meeting; Paul M. Andrews, Signal Oil & Gas Co., second from right, for serving as general chairman; and E. C. Babson, Union Oil Co. of California, who served as district chairman. Basil Kantzer, right, of Union Oil Co., received Babson's award in his absence.

Oil May Be Elsewhere

Morgan says unknown sedimentary areas more extensive than those producing, we must look where others don't

LOS ANGELES.—To find the oil we need, oil companies will have to start looking where others may think there is no oil.

This is the opinion of Frank A. Morgan, vice president of Richfield Oil Corp. and president of the American Association of Petroleum Geologists.

Speaking here before the spring meeting of the Pacific Coast district of the American Petroleum Institute's Division of Production, Morgan said.

"I think we are prone to want to look for oil where the other fellow thinks there is oil, too. If our reserves are to continue to grow we can no longer enjoy this luxury—we cannot condemn any sedimentary area because we don't know anything about it."

Morgan told the production men there are more than 2,000,000 sq. miles of sedimentary areas in the United States and its continental shelves in which search can be made for structures and traps suitable for the accumulation of oil.

Areas in which little is known geologically, he added, are more extensive than those which have attracted the most intense exploration in the past.

He warned the West Coast group against any tendency "to live on our fat," saying any such tendency would precipitate an excessive lag in oil discoveries.

"We can't relax," he said, "while the Government develops, or starts to work up the technique of developing, that 80 billion barrels of shale oil in the Rocky Mountains, because by the time they get started on that job we will have lost the touch of oil finding which has been carried on so successfully by the oil industry in the past."

Frank Morgan, Richfield vice president, addressing A.P.I. meeting.

Wasco recovery efficiency.—Of the production papers given, one dealing with an investigation of the recovery efficiency of a natural water drive in the Vedder pool of Wasco field was very well received. It was presented by Nick van Wingen, of Petroleum Technologists, Inc.

This pool represents the first deep reservoir (average depth 13,000 ft.) in California to approach economic depletion. The fact the reservoir has shown a successful response to natural water drive lends encouragement to existing and planned artificial floods, he said.

The field was discovered in 1938. At the first of this year there were only 2 wells left of the 12 original producers completed there. These were producing only 45 bbl. of oil daily with an average water cut of 95 per cent.

Van Wingen, whose report was based on the results of an A.P.I. study committee, expected less than 30,000 bbl. more would be produced in placing the ultimate recovery at 4,750,000 bbl. Thus the natural water drive has resulted in a 50 per cent recovery of the initial stock-tank oil in place, or about 405 bbl. per acre-foot.

Effectiveness of the natural water drive is reflected in the fact current reservoir pressure is only 10 per cent lower than the initial pressure, van Wingen said. Factors favorable to an efficient water drive he listed as "the relatively thin formation, the continuity of the reservoir, the apparently even advance of the encroaching water, and the low oil-water viscosity ratio."

Muds and filtrates.—Results and laboratory tests to determine the effect of mud filtrates and mud particles upon the permeabilities of cores were reported by T. J. Nowak and R. F. Krueger, of Union Oil Co.'s research department.

Among their findings was the indication that fresh water and filtrates from fresh-water base muds significantly reduce the effective oil permeabilities of water-sensitive cores, whereas various salt solutions and filtrates from saline muds cause little reduction and in some cases produce an increase.

In the portion of their work dealing with the effect of mud particles on Alundum cores, consideration was given not only to evidence of particle invasion but also to filtrate losses during and to deplastering following

mudding off. Preliminary tests on these synthetic cores mudded off at high temperature and high pressure provided several interesting observations. Two of these were:

"Filtrate loss curves for each of the three field drilling fluids, clay-water, oil-base, and emulsion base, have indicated from tests on four synthetic cores whose permeabilities ranged from 14 to 248 md. that there is a dependence of filtrate loss upon the permeability of the formation.

"This result can apparently be explained by particle invasion into the core. In these particular tests, low permeability cores have shown filtrate losses higher than those for high permeability cores.

"Deplastering tests on the synthetic cores mudded off under jetting and scraping conditions indicate some permanent permeability impairment of 20 to 35 per cent in cores of high permeability for each of the three drilling fluids tested.

"However, there appears to be no permanent permeability impairment for water-insensitive cores of low original oil permeability. The same tests on cores mudded off under circulating conditions indicate almost complete recovery of original oil permeability upon backflow for all muds for the whole permeability range.

"However, it may be inferred that, in practice, at least for the clay-water base and emulsion muds, a significant length of time would be required for such restoration to take place."

New officers.—Paul Andrews, Signal Oil & Gas Co., was elected Pacific Coast district chairman to succeed E. C. Babson, Union Oil Co.

Vice chairmen elected were C. C. Gandaubert, General Petroleum Corp., for the Los Angeles Basin area; W. T. Woodward, Woodward & Reynolds, South San Joaquin Valley; B. B. Grainger, Tide Water Associated Oil Co., Coastal area; and J. C. Chescheir, Jr., Tretolite Co., Coalinga-Kettleman area.

L.P.G. Motor Fuel

Many refiners think L.P.G. use as gasoline substitute can increase life of our petroleum reserves 50 per cent

George Weber

THE widespread use of liquefied petroleum gas as a motor fuel has the potentiality of increasing the life of our petroleum reserves by more than 50 per cent.

This broad statement summarized the views of a number of manufacturers, distributors, and users of L.P.G. expressed during a special session of the recent midyear meeting of the American Petroleum Institute's Division of Refining.

Of all the markets and uses for L.P.G., the only one showing an accelerated rate of growth in postwar years is the market for power purposes in nonpassenger-car engines, according to R. C. Alden, Forrest E. Gilmore, and Paul Tucker of Phillips Petroleum Co. With this potentially large new market incentive, it is quite likely that past high rates of growth for the L.P.G. industry will continue for some time to come.

L.P.G. reserves.—In a thorough survey of the industry, Alden and his associates pointed to the fact, surprising to many, that L.P.G. reserves from crude-oil refining and natural-gas sources now total an estimated 14.3 billion barrels. This compares with an estimated reserve of 16 billion barrels of gasoline from crude oil and natural gas.

While reserves of L.P.G. are approaching equality with those of motor fuel, a very significant development, it was noted at the meeting that L.P.G. recovery, as such, leaves much room for expansion. Currently more than half of the C_3's and C_4's in refinery operations are being liquefied, but less than a fourth of these hydrocarbons are being liquefied or recovered as L.P.G. in natural-gas operations.

Distribution needs.—Despite the extensive strides made in expanding distribution facilities for L.P.G., the new industry has little reason for feeling complacent about the future, said Howard E. Felt, vice president of Warren Petroleum Corp. Experience gained in the wake of the severe winter just past has thoroughly convinced industry leaders that storage is the key facility required.

"The amount of transportation needed and, to a large extent, the number of bulk plants are determined by available storage," Felt said. "Inasmuch as sales for domestic and industrial purposes constantly exceed 50 per cent of the total volume marketed, and since the heat load is such a significant factor in this market, the unbalanced demand between summer and winter is by all odds the industry's No. 1 problem."

Underground storage.—Felt discussed new developments which promise improved future L.P.G. distribution. Underground storage in water sands, caverns washed in salt domes, and caverns excavated by simple mining operations was cited as having significant possibilities, especially if such storage facilities could be found near markets. Such reservoir costs vary from $1.00 to $2.50 per barrel, Felt said, as compared with $20 per barrel for steel storage.

Automotive fuel.—The major field of expanding L.P.G. markets, that of automotive fuel for trucks and buses, occupied the bulk of attention at the session. Eugene S. Corner, Standard Oil Development Co., and E. H. Berg, Esso Standard Oil Co., presented comparative data on the economics of L.P.G., gasoline, and diesel fuel for these automotive uses. Considering investment, maintenance costs, and taxes, they concluded:

1. "The conversion of large bus and truck fleets from gasoline to propane will permit a rapid payout of new investment and conversion costs on the basis of propane prices being from a few tenths of a cent per gallon to about 3.5 cents per gallon below gasoline prices, depending on the type of operation and amount of state taxes, provided a 10:1 compression-ratio engine is used with propane. Inasmuch as current price differentials are from 5 to 8 cents per gallon in favor of propane, the present trend toward the use of L.P.G. as a replacement for gasoline may be expected to continue.

2. "With regard to the comparison of propane to diesel fuel at current price levels, propane is competitive under a short-term amortization of storage facilities only where it is available at minimum cost and where total tax levied on diesel fuel is approximately equal to that on propane.

New Gas Line

Gulf Coast-Appalachian line planned by new firm

HOUSTON.—Formation of Texas Ohio Gas Co. for the purpose of constructing a 30-in. natural-gas pipe line from the Gulf Coast area to the Central Appalachian area has been announced by its incorporators.

The pipe line is to have a capacity of approximately 500,000,000 cu. ft. per day. It is understood the corporation has made arrangements to purchase an adequate supply of gas to meet company demands for at least 20 years.

Company officials declined to say anything concerning arrangements for financing the huge project.

Officers of the company are taking steps to formalize the project preparatory to the filing of an application for a certificate of public convenience and necessity with the Federal Power Commission.

The new corporation will acquire certain assets of Valley Gas Pipe Line Co., Inc., under an agreement authorized at a special meeting of Valley Gas Pipe Line Co. stockholders on April 9. Accordingly the present application of Valley Gas before the Federal Power Commission has been dismissed without prejudice.

Incorporating directors of Texas Ohio Gas Co. are T. B. Hoffer, independent operator of McAllen, Tex.; L. E. Reed, pipe-line contractor of Houston; and J. R. McAuliffe, Houston insurance man.

It is expected that officers of the corporation will be announced in the immediate future.

Residuum Treatment

More cat cracking feeds recovered by new process

KANSAS CITY.—A process now under development which combines high-vacuum distillation and visbreaking for recovery of very heavy fractions from crude residuum was revealed this week before the Midwest meeting here of the American Institute of Chemical Engineers.

The high-vacuum distillation, described by J. G. Allen, D. M. Little, and P. M. Waddill, of Phillips Petroleum Co., Bartlesville, Okla., operates at absolute pressures of 100 to 800 microns (0.1 to 0.8 mm.). It is being used to recover clean, high-boiling hydrocarbons with low carbon residue from topped crude.

Thermal cracking or visbreaking of the resulting high-vacuum residuum has been achieved with both pilot-plant and commercial equipment through use of a new type of radiant heater. *(The Oil and Gas Journal, May 10, page 106).* Fuel-oil yields thus were decreased and yields of catalytic feed stocks were increased.

Poisoned catalyst.—Low yields of gasoline and high yields of byproduct fuel gas and coke in catalytic cracking operations may be due to contamination of the catalyst by metals deposited from the feed, according to B. J. Duffy, Jr., and H. M. Hart, research department of Standard Oil Co. (Ind.).

The catalyst carbon factor, as determined by the Indiana Relative Activity test and by plant yields in operations at Standard's Sugar Creek, Mo., refinery, was found to respond to changes in the metals content of the feed.

An efficient method of estimating catalyst makeup and discard rates was provided through study of relationships between plant yield, catalyst carbon factor, and feed quality.

Catalyst-regeneration test.—A laboratory test devised by Standard and tested commercially has disclosed significant information on regeneration rates of cracking catalysts, it was reported by G. M. Webb and M. J. Den Herder, research department, Whiting, Ind., refinery.

Excess air is passed over carbonized catalyst at 1,050° F. and the carbon oxides thus formed are measured periodically.

Application of the test to silica-magnesia cracking catalyst has shown that this catalyst regenerates less readily than others. Among the used catalysts, natural catalyst has the highest equilibrium regeneration rate. Silica alumina regenerates approximately 70 per cent as fast as natural, the test disclosed.

It was found that catalysts with large pore structures (natural and silica-alumina) improve in regeneration rate with use, while those with only a single small pore system exhibit opposite tendencies.

Imports Drop

Figure down to 838,000 bbl. daily as exports rise

TOTAL imports into continental United States decreased and exports increased during the month of March, according to data released by the Department of Commerce.

Imports averaged 838,000 bbl. daily for the month compared with 923,000 bbl. daily in February and 881,000 bbl. daily in March 1950. The increase in crude receipts of 7,000 bbl. daily was more than offset by a decrease of 92,000 bbl. daily in product imports.

Daily average receipts of crude from Mexico, Venezuela, and Saudi Arabia were less in March than in February. Gains were reported for Colombia and Kuwait. The crude listed as "other" came to refineries on the West Coast from British Malaya.

Residual imports were off 79,000 bbl. daily from February, and other products dropped 13,000 bbl. daily.

Exports of crude and products averaged 285,000 bbl. daily in March, up 52,000 bbl. daily from February. Major increases by products were gasoline, up 23,600 bbl. daily, and lube oils, up 15,600 bbl. daily.

IMPORTS INTO CONTINENTAL UNITED STATES

(Thousands of barrels)

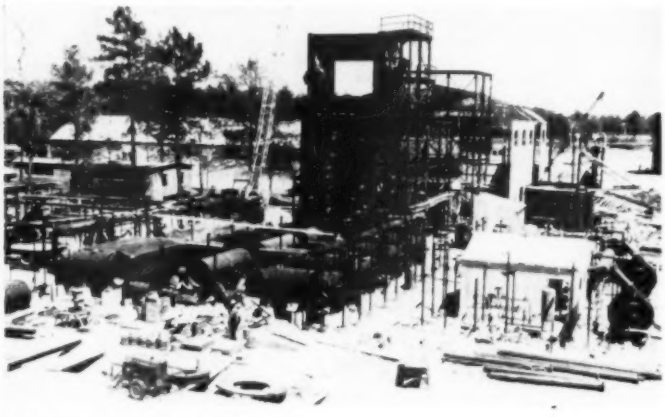
	Mar. 1951	Feb. 1951	Mar. 1950
Crude—			
Mexico	1,049	1,013	889
Colombia	1,504	1,146	1,587
Venezuela	8,550	7,948	9,634
Kuwait	1,724	1,407	1,506
Saudi Arabia	1,152	1,098	1,308
Other	325	86	
Total crude	14,304	12,698	14,924
Daily average	461	454	481
Products—			
Residual fuel	10,941	12,103	11,680
Other products	748	1,042	726
Total products	11,689	13,145	12,406
Daily average	377	469	400
Total all oils	25,993	25,843	27,330
Daily average	838	923	881

EXPORTS*

(Thousands of barrels)

	Mar. 1951	Feb. 1951	Mar. 1950
Crude	2,640	2,471	2,153
Gasoline	1,941	1,092	1,212
Kerosine	38	125	213
Distillate fuel	773	638	950
Residual fuel	1,077	644	1,193
Lube oils	1,534	950	1,123
Other products	847	600	389
Total all oils	8,850	6,520	7,233
Daily average	285	233	233

*Excludes shipments to territories.



Oil-to-Carbon Black Plant

Now beginning to take shape near Lake Charles, La., is the $2,000,000 plant of Continental Oil Black Co. which will produce high-abrasion carbon black from oil. It is a joint enterprise of Continental Oil Co. and Continental Carbon Co. The plant will have an annual capacity of 25,000,000 lb. Rise in the use of synthetic rubbers, especially cold rubber, has increased substantially the demand for high-abrasion carbon black. The plant, located at Westlake, is expected to be in production in June. Output will be distributed by Witco Chemical Co.

Shortages Growing

NPC told critical-materials list soon to include thousands of items; synthetic-fuels, demand, defense reports heard

Bertram F. Linz

WASHINGTON.—An NPC committee on materials and chemicals requirements of the oil and gas industries advised the Interior Department last week that several thousand products are now or prospectively in short supply.

The report was submitted by Committee Chairman Reese H. Taylor, president of Union Oil Co. of California, at the second 1951 meeting of the National Petroleum Council. It was the result of a request for a study of the supply situation by Secretary Oscar L. Chapman.

The situation will be reviewed in another report to be submitted at the next council meeting, probably in September. The list was made available to the department at this time so that consideration can be given to ways of assuring the allocation of sufficient critical materials to enable the industry to meet the production targets set under the defense program.

Drilling materials. — The committee reported that critical materials for drilling that are in short supply include tannic acid, all types of bearings, caustic soda, cement and all cementing equipment, chromates, air and conventional clutches and parts, carburetors, crankshafts, magnetos, spark plugs and radiators for internal-combustion engines; water and fuel line pipe, mica, roller chain and sprockets, rubber hose for air, oil and fuel lines, and torque converters.

Much longer lists were submitted, however, of materials in short supply for production, refining, and transportation.

Synthetic-fuels study. — A committee on synthetic-liquid-fuel production costs has encountered difficulties because of the magnitude of the job and will not be able to work out its computations for another several months, it was reported by Chairman W. S. S. Rodgers, chairman of the board of The Texas Co.

More than 125 men, including 85 engineers, are engaged in a check of production costs worked out by the Bureau of Mines on the basis of its experimental work. They seek to establish the costs, both on present processes and on a future basis allowing for possible technological research improvements over the next 5 or 10 years, of plants to provide 250,000 bbl. daily of synthetic fuels from coal hydrogenation, coal gasification and fuel synthetics, and shale oil refining.

Rodgers reported that four subcommittees are engaged in the study, one feature of which has been a "dry run" projection of the cost of a hypothetic 20,000-bbl. daily plant at Rock Springs, Colo., a locality which has been under consideration by the Bureau of Mines where there is both coal and water available. The study has not yet been completed, but one of the economic problems encountered has been that of housing workers who might be employed at such a plant.

Hemispheric production study. — A committee studying the cost in money and materials of developing an additional 1,000,000 bbl. daily of products from Western Hemisphere sources has worked out the basis of its investigation, requested by the Interior Department in January.

The study will include the cost of balancing present crude production capacity with present refining capacity; cost of developing new crude production and refineries, etc., in District 3; cost of exploration, development and refinery construction in the Pacific Northwest for Alberta oil; and the cost of getting Venezuelan crude and refining it on the East Coast.

Demand report.—The Petroleum Administration still estimates that the increase in demand this year over 1950 will be in the range of 10 per cent, the council was told by Cecil L. Burrill, director of the program division. By products, it is expected, the increase will range from 7.8 per cent for residual fuel through 9.4 per cent for kerosene and 12.1 per cent for gasoline to 14 per cent for distillates.

Projections of demand beyond the end of this year, Burrill said, indicate that the first quarter of 1952 will show an average of 5 per cent increase over the same period this year.

PAD expects that domestic crude production will average 6,065,000 bbl. daily this year, with a high during the second and third quarters of 6,160,000 bbl. a day.

In order to meet the 10 per cent higher demand this year and make desirable increases in stocks, Burrill told the council, refineries will have to run at an average of about 91 per cent of capacity. By the end of this year, he said, refinery capacity is expected to reach 7,200,000 bbl. daily.

Present target of PAD, Burrill indicated, is to have about the same number-of-days stocks at the end of March 1952, as at the end of March 1951, but he pointed out that because of heavier demand this will require a substantial increase in barrels.

Status questioned.—Commending the progress made by the industry thus far in meeting the requirements of the defense program, Secretary Chapman told the council to go ahead as presently constituted pending a decision by the Department of Justice, expected to be reached within a few days, whether its setup is in conformity with the restrictions on industry committees contained in the Defense Production Act.

That act required that all committees serving in an advisory capacity to defense agencies must be headed by a full-time government official, but it has been Chapman's contention that the NPC does not fall in the category of advisory boards and should be continued under industry leadership.

Regulated Sales

States may control sales of natural gas, court holds

WASHINGTON. — The Supreme Court this week ruled that states may regulate sale of natural gas piped in from another state if it is to compete with an established utility.

Specifically it ruled that Panhandle Eastern Pipe Line Co. may not make direct sales to industrial consumers without first obtaining state permission.

Panhandle announced in 1945, according to the Supreme Court decision, a policy of making large direct sales to industrial consumers and obtained a contract for supplying gas to the Ford plant at Dearborn, Mich.

On complaint of Michigan Consolidated Gas Co., which buys its gas from Panhandle, the Michigan Public Service Commission ordered Panhandle not to sell gas direct unless it first obtained a certificate of public convenience and necessity from the commission.

This was thrown out by a local court in Michigan, but it was sustained by a higher court.

The Supreme Court decision upholds the state commission and forbids the direct sale.

It was brought out in the decision that Michigan Consolidated already had a line parallel to that which Panhandle would have built to serve Ford, and was already serving the company.

Drill-Pipe Quotas

PAD urges applicants to submit forms by June 1

WASHINGTON. — Applications for drill-pipe quotas should submit by June their PAD-17DP forms for priority assistance for the fourth quarter even though the deadline is June 30, the industry was advised by Bruce K. Brown, PAD deputy administrator.

"Drill-pipe manufacture requires a longer lead time at the pipe mills than rollings of casing and tubing," Brown said, "and the earlier date will enable PAD to process applications in time to permit contractors and operators to place rated orders for drill pipe in advance of their orders for fourth quarter delivery of casing and tubing."

At the same time Interior Secretary Chapman announced that oil and gas operators and drilling contractors have been notified by PAD of action taken on their applications for priorities for the third quarter.

Authorizations issued to about 400 operators and drilling contractors, based on applications filed on Form PAD-17DP, will permit use of a DO-48 rating on orders for drill pipe for delivery beginning in the third quarter, Chapman said.

Total tonnage of drill pipe available during the third quarter, according to Brown, will be about half of the amount requested by operators and contractors.

About 25 per cent of the applications received by PAD were rejected, he said, because drill pipe on hand or in use by the applicant was in good enough condition to permit continued operation through the third quarter. Authorizations issued will permit applicants to obtain tonnages considered adequate to keep their drilling rigs operating.

Any operator or contractor who believes that the amount of drill pipe authorized by PAD for third-quarter delivery is insufficient to meet his requirements may submit a supplemental application with supporting information as to his needs, Brown said. Supplemental authorizations will be issued, to the extent possible, to enable operators to obtain strings to replace pipe lost in holes or to meet other emergency needs.

PAD Gets Finance Adviser

WASHINGTON.—Elmer E. Batzell, a Washington lawyer and one time attorney for the war-time PAW, has been appointed finance counselor of Petroleum Administration for Defense.

In this connection Batzell will handle accelerated tax amortization cases for the petroleum industry.

WATCHING WASHINGTON

Bertram F. Linz

After Meat, Gasoline?

Rationing of meat, anticipated by Price Stabilization Director Michael V. DiSalle next fall, may be the tip-off on rationing of gasoline and a new drive by Interior Secretary Oscar L. Chapman for the launching of a synthetic-liquid-fuels industry.

Once rationing is instituted for any commodity it is likely to spread to others, but the possibility of gasoline rationing was directly raised by Orville D. Judd, acting chief of the OPS petroleum branch, who warns that increasing military demands may bring a serious threat of oil shortages next winter.

A definite prospect of an oil shortage is expected in Washington to bring an immediate move by Chapman for a showdown on synthetic fuels.

While he admits that the question of actual cost of synthetic fuel vs. petroleum has not been settled, Chapman contends that the steel required to produce gasoline from oil shale is no more than is required for petroleum and that the capital investment for shale oil may soon be less than is required by the oil industry for each barrel of added capacity.

Polluted Water

The United States is faced with the prospect of having to spend between $9 and $12 billion over the next decade to keep its drinking water safe, and more than half of the money will have to come out of the pockets of industries whose wastes now pollute our water resources.

That bad news was broken this week to a conference of state sanitary engineers who were told that municipalities and industries were not even keeping abreast of the growing water-pollution problem.

More water is used by industry as a raw material than any other commodity. Most of the water so used is discharged as waste. Studies have shown that there are more than 22,000 sources of pollution in the country, about half of them industrial, but only 9,300 treating plants, of which 2,600 are industrial. The number of treating plants, experts say, must be doubled in the next 10 years if we are not to suffer serious losses of potable water supplies.

In many oil installations of one kind of another, provision is made for purification of waste water before it goes back into streams, but there are more whose waste water is killing fish and vegetation and creating problems for towns and cities.

High-Flying Diesels

The diesel locomotive is now doing almost five times as much work on the railroads of the country as it did 5 years ago and last year, for the first time, accounted for more gross ton-miles than the coal-burning steam engine.

Recent statistics of the Interstate Commerce Commission show that the mileage of diesel-hauled freight trains rose between 1946 and 1950 from 9.73 to 44.13 per cent of all train mileage, while that of coal-burning steam engines declined from 69.55 to 42.55 per cent.

With oil-burning steam engines, petroleum now is fueling 55.5 per cent of train miles, just double that in 1946.

A similar record has been made by diesel locomotives in passenger traffic, where it now accounts for 57.3 per cent of total train mileage as compared with 15.28 per cent in 1946. In passenger service, however, the importance of oil-burning steam engine has declined as well as that of the coal engine, the former dropping from 26.19 per cent of the traffic in 1946 to 13.59 per cent last year while coal-engine mileage dropped from 52 to 22.72 per cent in the same period.

Permit to Operate

Proposals for the federal licensing of all business establishments subject to price control, under which the continuance of a business would be at the mercy of the Office of Price Stabilization, are being pushed for inclusion in the bill now before Congress to extend and strengthen the Defense Production Act.

Federal licensing of business was first proposed some years ago by Senator O'Mahoney of Wyoming and the late Senator Borah of Idaho but never received much sympathy in Congress.

The idea has been revived as a means of "strengthening" price controls and, as submitted to Congress, would permit the President to suspend a license for 12 months, and thereby put an establishment out of business, whenever he has reason to believe the licensee has violated any price-control regulation.

All-Out Effort Asked

Truman asks maximum oil and gas production; Wilson says industry will have to skimp on materials in achieving it

WASHINGTON.—President Truman last week called on the oil and gas industries for all-out production, but Defense Mobilization Director Charles E. Wilson warned that this would have to be accomplished with a minimum of materials.

Addressing industry directly for the first time, Truman told the National Petroleum Council, Gas Industry Advisory Committee, and representatives of other defense agencies under the Interior Department that what has been accomplished in getting the defense program rolling is only the prelude to the much greater effort that must be made. He emphasized that "the largest part of the problem is still ahead of us."

Facing an apparent decision of Congress to provide only about three-fourths of the $10,000,000,000 he asked in new taxes, including $225,000,000 to $300,000,000 through revision of the percentage depletion allowance, the President urged business to get behind his tax program and his proposals for stiff price and wage controls in the bill now pending to extend the life of the Defense Production Act until June 30, 1953.

Scheduling a must.—While agreeing with the President that the production of oil and natural gas, among other commodities, must be greatly expanded, Wilson declared that close scheduling of the requirements of the oil and gas industries for steel pipe and strict adherence to those schedules would be necessary.

Wilson's decision will be enforced in the application of the Controlled Materials Plan, it was indicated by Manly Fleischmann, head of the National Production Authority, who also participated in the symposium on defense.

"Your industries must demand no more steel than you actually need," Wilson told the advisory boards. "I hope you get down to a scheduling and that you won't make it necessary for NPA to give you that pipe 1 month sooner than you actually need it."

Scheduling of tubular goods requirements, Wilson said, should be handled on a monthly basis to provide for an even flow of pipe to all activities needing it.

Fleischmann explained that it has always been the purpose of the NPA to adopt a Controlled Materials Plan but that its application had to be held up until detailed figures on military requirements became available.

CMP details.—The CMP will go into effect July 1. Its first-quarter operation, Fleischmann said, will be in the nature of a "trial run" and, he added, "if we get it operating well by October we will be doing better than many expect."

Reflecting the uncertainty over the international situation which prevails in Washington, Fleischmann said the CMP, which was the only plan of materials control that worked successfully in World War II, is designed not only to aid in handling the defense program but as a machine to be ready immediately in the event of war, when no time could be wasted in laying the groundwork for the tremendous expansion of industrial activity that would be required.

Fleischmann told the advisory groups that if the country is to succeed with its arms program it will be "quite impossible" for industry to expand generally. Accordingly, he said, the oil and other industries cannot expand as much as they desire and that to take care of the necessary expansion of vital industries others less essential will have to be cut back to levels below those of 1950.

Our

FIFTIETH

YEAR

You are now reading Number 2 of Volume 50 of The Oil and Gas Journal, which means that the Journal is now in its fiftieth year.

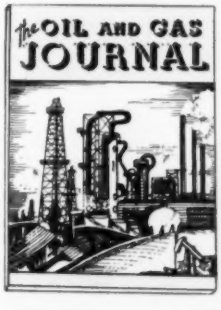
The Journal got its start where the oil industry of the Southwest got its big start, in the Spindletop boom at Beaumont right after the turn of the century. For five decades the Journal and the oil industry have been expanding and developing, each helping the other, each having troubles and triumphs, each achieving greatness.

To commemorate this half century of progress in petroleum and in publishing, we have printed a book on "Fifty Years of Oil in the Southwest." Every Journal subscriber will receive a copy as a supplement to the May 31 issue.

This book contains a section on The Journal Story. It tells how the Journal got started, what kept it going, and how it reached its present stature. When we started to prepare this we feared it might be rather dull reading, but it proved to be a fascinating piece of work.

The history of the Journal is so interwoven with the history of the oil industry that the two were written together as a single, running account. If you are an old timer in oil, The Journal Story will bring back many memories, and if you are a newcomer to oil this story will furnish a useful background for present conditions.

Whoever you are, if you have any interest in oil you will want a copy of our Golden Anniversary Number. And along with all the other data and chronology it contains you will want to read The Journal Story.



1951 Editorial Conference, The Oil and Gas Journal

The entire editorial staff of The Oil and Gas Journal gathered in Tulsa for a 3-day conference May 9-11. The 3 days were spent in discussing editorial plans for the coming year based on reports from district and home-office members of the staff in direct touch with domestic and foreign operations. In addition to the staff conferences, the group was addressed by D. R. Snow, vice president of Sunray Oil Corp., and by W. J. Carthaus, vice president of Deep Rock Oil Corp. The editors were guests of Phillips Petroleum Co. at a barbecue at Woolaroc Ranch near Bartlesville May 10. Sitting, left to right: Carl F. Hoot, Roy F. Carlson, Paul Reed, Jorge Sarmiento, R. B. Tuttle, Lynn M. Nichols, Bertram F. Linz, Neil Williams, C. Dudley Johnston, John C. Casper, C. O. Willson, Leigh S. McCaslin, Jr., John M. Cummings, Oscar B. Irizarry, Robert J. Enright, Connie Bahos, F. Lawrence Resen, Lucy Dee Owen, Dahl M. Duff, Martha Albright, Philip C. Ingalls, William P. Sterne, John C. Reidel. Standing: Henry D. Ralph, George H. Weber, Kenneth B. Barnes, D. H. Stormont, Joseph A. Kornfeld, S. H. Rourke, P. C. Lauinger. Not in photo were Ted A. Armstrong, Polly De Armond, and Arturo Carricarte.

Storage Study

Steel-minded NPC to check underground possibilities

WASHINGTON.—Feasibility of using underground storage for petroleum products, including liquefied petroleum gas, will be studied by the National Petroleum Council.

The Interior Department has requested this be done with a view to determining whether it could add storage capacity badly needed without use of the substantial quantities of steel required for aboveground tankage.

Hugh A. Stewart, acting director of the Oil and Gas Division, pointed out that underground storage might not only save steel but be less vulnerable to possible enemy attack.

Quebracho study.—The council also has agreed to make a further study on the requirements of the industry for quebracho and the possible development of substitutes which would make the United States self-sufficient in the event of an emergency.

In requesting this study, Stewart disclosed that while the NPC report of April 27, 1949, held that the oil industry is not dependent on quebracho and that other products are available to meet the needs for mud treating, the Munitions Board is still concerned over the possibility of a shortage of quebracho, important in the tanning of leather where no satisfactory substitute has yet been developed.

Under NPA Order M-57, the use of quebracho for drilling purposes is being sharply curtailed, but the impact of the order will not be felt fully for several months, within which period the industry may be able to work out and adopt satisfactory substitutes, Stewart said. But, he added, an adequate supply of suitable mud-treating additives must be available if the present drilling program is to be carried out and the NPC should make a comprehensive study of possible sources of this material.

Other studies.—Stewart also secured council approval of requests for studies of the probable availability of liquefied petroleum gas, adequacy of transportation facilities and minimum materials required for production and transportation to alleviate possible shortages; trends in the manufacture, sale, installation, and use of oil-burning equipment, and a complete census of tank trucks.

Refining Units Approved

WASHINGTON. — Accelerated amortization of an additional $58,000,000 of petroleum facilities has been certified by the Defense Production Administration.

Certification by DPA permits the amortization over a period of 60 months of that proportion of the cost of new projects as is held necessary for purely defense purposes.

The DPA announced that 90 certificates issued between April 27 and May 3 included the following for oil facilities:

Shell Oil Co., 85 per cent of $10,400,000 for benzene production at Deer Park (Harris County), Texas; Pure Oil Co., 75 per cent of $11,140,000 for butene production at Nederland, Tex.; Shell Oil Co., 100 per cent of $243,000 for butenes storage at Wood River, Ill.; Shell Oil Co., 75 per cent of $274,000 for pipe-line construction at Wood River, Ill.; Standard Oil Co. of California, 100 per cent of $24,000 for alkylate production at Richmond, Calif.; American Cyanamid Co., 85 per cent of $5,077,034 for synthetic fluid cracking catalyst production at Michigan City, Ind.

Socony-Vacuum Oil Co., 100 per cent of $260,000 for butene production at East St. Louis, Ill.; Aromatics Refining Co., 85 per cent of $11,630,000 for production of benzene, xylene, toluene concentrate and motor gasoline at Baton Rouge, La.; Roosevelt Oil & Refining Corp., 85 per cent of $1,500,000 for benzene production at Mt. Pleasant, Mich.; Texas Natural Gasoline Corp., 80 per cent of $435,000 for rail transportation of iso-butane and normal butene; Seaboard Shipping Corp., New York, 80 per cent of $254,819 for water transportation of oil; Dow Chemical Co., 60 per cent of $1,061,000 for a petroleum gases pipe line; Dow Chemical Co., 60 per cent of $5,600,000 for ethylene production at Freeport, Tex.; Standard Oil Co. of Texas, 80 per cent of $10,264,000 for production of heating oils, gasolines and diesel fuels at El Paso, Tex.

PAD to Handle Construction

WASHINGTON. — Responsibility for the handling of all materials controls on construction for the oil and gas industry has been delegated by the National Production Authority to the Petroleum Administration.

Heretofore, construction of oil and gas facilities has been subject to control under the NPA construction order M-4. The delegation of authority will give PAD the same control over construction as it has over materials used in oil and gas operations.

A special regulation covering construction controls for the industry, defining what types of facilities may or may not be built has been drafted and is now being reviewed by NPA.

Defense Orders

WASHINGTON.—Defense agencies issued the following orders, directives, or amendments thereto during the past week:

Office of Price Stabilization

CPR 32, May 8, establishing ceiling prices for crude oil.

CPR 33, May 7, establishing ceiling prices on ferrotungsten and other tungsten products.

Supplementary Regulation 9, Revision 1, May 7, extends to all exporters the authority to fulfill existing contracts entered into prior to January 26, 1951.

National Production Authority

CMP Regulation 2, May 10, limiting the amounts of certain controlled materials plan materials a user may have in inventory.

CMP Regulation 4, May 10, establishing rules for delivery of controlled materials.

M-45, Schedule 6, May 11, allocating resorcinol.

M-45, Schedule 5, May 11, allocating polyethylene.

Amendment to construction order M-4, May 11, exempting construction of plants for which a certificate of necessity has been granted, reiterating restrictions against certain classes of unnecessary structures, and exempting small jobs using less than 25 tons of steel.

Supply Plan Developing

WASHINGTON.—Plans for a voluntary agreement under which American oil companies operating abroad may act jointly to meet the situation arising out of an interruption of foreign supplies are nearing completion. They soon may be the subject of a general conference to which representatives of all segments of the industry will be invited.

The agreement is being worked out by a group of oil-company executives and PAD officials as a result of the warning of possible dislocations in Middle East supplies raised by the recent strike at the Abadan, Iran, refinery.

Reporting on the progress of the negotiations, Deputy Petroleum Adminstrator Bruce K. Brown said there is no intention of putting the agreement into operation unless there is an emergency in the supply situation, but its development now is necessary to avoid any possible delay in filling the void which would be created by any future interruption of Middle East production or refining operations.

Gas Council Lays Plans

WASHINGTON. — Members of the recently created gas-industry advisory council held their first meeting May 9 to discuss organization problems.

Differing from the National Petroleum Council in that it was set up as an advisory committee to Interior Secretary Oscar L. Chapman on matters involving the gas industry, the council will be presided over by a full-time government official, C. Pratt Rather, assistant deputy PAD administrator in charge of gas.

The council named a subcommittee to advise PAD on the organization of field or regional committees and on the functional setup of subcommittees within the council itself. The subcommittee also will assist PAD in recruiting manpower from industry to staff the gas branch.

Navy Office to Denver

WASHINGTON. — The Navy Depart has announced that the office of the director of Naval Petroleum and Oil Shale Reserves will be moved from Washington to Denver about June 15.

The new office is expected to be formally opened July 2 in the Mining Exchange Building, 1030 Fifteenth Street, Denver, under Capt. R. H. Meade, who succeeded Comdr. William G. Greenman when the latter retired early this year.

NPC Urges Deferment Policy

WASHINGTON. — The Petroleum Administration for Defense has been advised by the National Petroleum Council to set up a unit to review occupational-deferment cases for petroleum-industry employes on request of employers.

The NPC proposal, contained in a report on oil and gas-industry manpower, also urged that the Defense Department set up a system of rotation for returning to the industry those employes drafted or ordered to active duty.

In view of the ever-present possibility of all-out mobilization, PAD was urged to have on hand "well-defined plans for activation of its manpower organization on very short notice."

Radio Permits Issued

WASHINGTON.—Eight more construction permits in the petroleum radio service have been issued by the Federal Communications Commission.

The permits cover 10 base stations, 6 relay transmitters, and 75 mobile units.

They were issued to Colorado School of Mines, New York State Natural Gas Corp., Stanolind Oil & Gas Co., Humble Oil & Refining Co., Kerr-McGee Oil Industries, Inc., Transcontinental Gas Pipe Line Corp., G. S. I. Corp., and Northern Natural Gas Co.

Drilling Boost Urged

WASHINGTON. — Present rate of oil drilling of 43,000 wells per year is insufficient and should be expanded, Oscar L. Chapman, interior secretary, told the Senate banking committee Monday afternoon.

The committee is holding hearings on the Defense Production Act.

Chapman also asserted that domestic refining capacity should be expanded by 1953 to "almost" 8,000,000 bbl. per day.

CANADA

Crown-Reserve Sale

EDMONTON, Alta.—Sale of crown-reserve leases and exploration reservations in Alberta May 10 brought in $4,724,374 to the provincial government.

Nine quarter sections on the fringes of Redwater field brought $1,582,079 of the total.

The May 10 sale brought to $65,074,488 the total bonuses paid by oil companies since the crown-reserve system was inaugurated in 1948. Of this total, $52,720,645 has been paid in for Redwater field tracts.

More than a million acres of petroleum and natural-gas reservation lands in Alberta were acquired by four oil firms last week. The new tracts were located in the far northwestern, central western, and southeastern sectors of the province.

Imperial Oil, Ltd., acquired 488,617 acres in two blocks—the largest, a 297,477-acre spread, located about 160 miles northeast of Peace River, and a 191,140-acre block lying about 105 miles northeast of Fort Vermilion.

Other companies acquiring land were Amerada Petroleum Corp., California Standard, and Union Oil Co. of California.

Tubular Goods for Canada

WASHINGTON — Canadian operators have been given an allocation of 13,200 tons of oil-country tubular goods by the Petroleum Administration for third-quarter drilling.

The allocation completes the division of material between operators in the United States and abroad. An allotment previously was made for the drilling of approximately 2,400 wells this year in foreign countries other than Canada.

The 13,200 tons for Canadian operations will be distributed at a rate of not more than 4,400 tons a month through the petroleum division of the Canadian department of trade and commerce under the same standards that have been set up for distribution of tubular goods within the United States.

SOUTHWEST

Tax-Bill Shuffle

Senate sends omnibus bill to house with amendment

AUSTIN.—The Texas Senate has sent to the house the house-approved omnibus bill, which provides a permanent 10 per cent tax increase on oil, gas, sulfur, and other raw materials.

The senate, however, tacked on an amendment providing for the taxing of natural gas as it enters pipe lines.

The amendment, in effect, provides for the further taxing of natural gas without dedicating part of the income to the rural road system as provided in the house-approved Sewell bill, which was defeated earlier when an attempt was made to write it into the omnibus bill.

The so-called Hull amendment levies a property tax on dedicated gas reserves to be collected at the rate of 1 cent per 1,000 cu. ft. as the gas moves into pipe lines.

The chief merit of this amendment is that it would tax only exported gas, since gas sold in Texas would escape part or all of the tax by giving sellers credit for gross receipts. This would offset previous claims that taxing Texas gas would hurt home industries which use a large proportion of the gas produced within the state.

Opponents of the Hull amendment have raised the question of constitutionality of the bill, which would affect the sale of gas used in interstate commerce.

Gov. Allan Shivers, recognizing the probability that the constitutionality would be attacked in courts, has recommended passage of the bill.

However, the house has balked at attempts to rush the bill through for approval. Proponents of the Sewell bill promise a long fight, since they feel that their program for rural roads will be hurt.

Natural gas, meanwhile, appears certain to be taxed. It is merely a question of how much and how soon.

Gas Price-Fixing Approved

AUSTIN.—A senate committee has expressed its approval of a house-approved bill which would permit the Railroad Commission to set minimum field prices for natural gas to avoid waste.

By a 9 to 6 vote the committee matched sentiments in the house which gave a 72-43 passing vote on the bill last week.

The action followed a 4-hour session where proponents and opponents debated the measure.

Proponents argued that the bill was to control waste and hold off the threat of federal action on gas. They said price-fixing would follow only after public hearings.

Opponents argued against what they termed "price fixing" and said it would bring harm to both producers and consumers, but that consumers would eventually have to pay.

WEST COAST

Shell Buys Production

LOS ANGELES.—Shell Oil Co. has purchased from F. E. Fairfield, Long Beach, 940 acres with 32 producing wells in the South Mountain area near Santa Paula.

Purchase price was not disclosed.

Current production involved is about 2,500 bbl. per day. Shell will start operating and developing the properties as soon as legal work is completed.

The properties, located on top of South Mountain, are near Shell's Schieferle Heirs lease where the company already has considerable production. Fairfield has other holdings in the Santa Paula area which were not affected by the deal.

S. F. Bowlby, Shell vice president, who handled negotiations with Fairfield, said the purchase gives Shell an important extension to its already sizable holdings in the area and is tied in with the company's major expansion program announced some time ago.

Suit Asks $100,000,000

LOS ANGELES.—Suit for $100,000,000 has been filed in Superior Court here by Edward J. Preston against Standard Oil Co. of California, Hancock Oil Co., Signal Oil & Gas Co., and Southwest Exploration Co.

Preston, a pioneer West Coast operator, claims that after initiating the search for oil in submerged lands off Huntington Beach, he was denied drilling permits which others obtained because of political pressure and that they took advantage of his experience to develop the oil resources.

Preston in his suit says he spent $208,000 in 1929 to drill a successful test from piers, but that he lost rights to the oil when the state ruled the well had been completed after the drilling permit had expired.

Damages are sought on the basis of an alleged conspiracy through which large sums of money were used politically by the defendants to obtain the drilling rights.

Oil to Build Playgrounds

SACRAMENTO.—The California Assembly last week passed a bill which will permit the city of Long Beach to use 50 per cent of the income from its tidelands and submerged land leases for recreational and other facilities.

Heretofore the city could use these funds only for improvement of Long Beach Harbor. The city now has about $75,000,000 in the fund, which is being increased at the rate of about $24,000,000 annually.

Placerita Canyon Sale

LOS ANGELES.—Tevis F. Morrow, independent operator of California and Texas, last week acquired properties of Gordon Oil Co., Nelson Phillips Oil Co., and King Oil & Gas Co. in Placerita Canyon field near Newhall.

The properties acquired consist of about 400 acres with a current production of about 2,500 bbl. daily. There are 29 producers on Gordon properties, 18 on the Nelson Phillips, and 16 on King leases. Approximately $6,000,000 was involved in the transaction. Further development of the properties is planned by Morrow.

MEETINGS

Pipe Liners to Meet

ATLANTA.—Pipe-line innovations, practices, and problems will come up for review here May 21-23 at the products pipe-line technology conference of the American Petroleum Institute's Division of Transportation.

Subjects will include fire protection, filtering practices, movement and storage of liquefied petroleum gas, pipe-line scraping, and conversion of crude lines to products lines.

The final afternoon will be devoted to round-table discussions on problems pertaining to products-line technology.

One of the meeting highlights will be a day-long field trip to the Plantation Pipe Line Co. and Southeastern Pipe Line Co. stations at Chattahoochee, Bremen, and Doraville.

Radio-Sharing Plan

HOUSTON.—Region 4 of the National Petroleum Radio Frequency Coordination Association will vote on a plan for sharing frequencies with the National Forest Industries Communications at its forthcoming annual meeting.

The meeting of the group will be held May 25-26 at the Lamar Hotel, Houston. It precedes by a few weeks the national meeting of the NPRFCA in Washington, June 7.

G. F. McReynolds, Humble Oil & Refining Co., is chairman of Region 4, which represents 6,500 radio transmitters in Texas, Louisiana, Arkansas, and Mississippi.

TECHNOLOGY

New Acetylene Process

TEXAS CITY.—Carbide & Carbon Chemicals Co., well pleased with its new process of making acetylene by combining methane and oxygen, has announced plans for a large expansion of its plant here.

The company for the past year has been producing acetylene through a partial oxidation process involving the high-temperature reaction of methane and oxygen. The two highly reactive feed materials are combined chemically to produce a gas mixture containing essentially acetylene, with smaller percentages of other gases.

The plant is the first commercial installation in the United States to use the process. Experimental work was begun in 1945, and the process later was proved by a pilot-plant project. A similar process was developed by the Germans, who had a small plant in operation during World War II, but the finished product was not as pure as that made at Texas City.

Expansion plans, company officials said, will depend upon receipt of government priorities and certificates.

The Texas City installation includes a purification unit which separates acetylene from the gas mixture and raises the acetylene to a high degree of purity. After purification, it is used in the manufacture of Vinylite resins, important plastics in the defense program.

It is expected that the partial oxidation process will play an important part in the chemicals field, since acetylene gas is a valuable raw material in the manufacture of many industrial chemicals, some of which depend upon acetylene exclusively.

New Cat Cracking Process

A new catalytic cracking process termed "Hydrodesulfurization" has been developed by Union Oil Co. of California.

The company is now considering early construction of a commercial unit at the 69,000-bbl. per day Wilmington refinery. According to W. L. Stewart, Jr., Union executive vice president, the process was developed specifically to process Santa Maria crude fractions.

The process employs a newly developed catalyst and will operate on the moving-bed principle. As the name implies, it will involve hydrogenation and desulfurization of heavy, sour charge stocks.

Santa Maria crude is topped, yielding a 300° F. end point gasoline, and the remainder of the heavy crude is charged to a coking unit. The thermally cracked distillate from the coker, a black fuel oil averaging 4½ per cent sulfur with an end point of about 700° F. will comprise charge to the proposed cat unit, yielding upgraded, desulfurized distillate products.

Actual construction work on the new proposed unit probably will not start until the fourth quarter of this year.

GULF COAST

Air-Base Leasing

Interior Department feels other wells draining area

WASHINGTON.—The Interior Department will open bids June 6 for leases for oil and gas development on some of the land at Barksdale Air Base, Bossier Parish, Louisiana, recently transferred to the department by the Air Force.

The department is offering approximately 2,060 acres in three tracts of 635, 642, and 782 acres, respectively, but only 1,650 acres of surface area of the lands can be occupied for oil and gas operations without interference with the use of the air base for military purposes.

Directional drilling will be necessary. Part of the remaining 1,000 acres taken over from the Air Force but not included in the lease offering also could be developed by directional drilling, the department said.

The mineral leasing laws have been held not to be applicable in this instance and the leasing of the air base lands is being done under the general supervisory authority of the Secretary of the Interior.

The leases will be sold on a cash-bonus basis at a nominal rental or minimum royalty of $1 an acre per year and a basic royalty of 12½ per cent on all production. They also provide for an additional royalty of 12½ per cent on all production from the Jeter and Pettit gas zones until such additional royalty amounts to $500 per acre. Royalty on gas will be computed on the basis of a value of not less than 7 cents a 1,000 cubic feet.

The Barksdale Air Base comprises nearly 22,000 acres of land of which some 7,500 acres may be within the productive limits of Sligo field. The leases are being offered because the deposits are believed to be subject to extensive drainage by wells on privately owned lands in the field.

Sligo field was discovered in 1922 when gas production was found in the Nacatoch sand. To date commercial gas production also has been found in the Smith, Lands, Schuler, Jeter and Pettit zones, and oil production in the Herald and Schuler Estate zones. Some 70 oil wells and 75 gas wells are currently producing at an approximate annual rate of nearly 500,000 bbl. of oil and more than 30,000,000 M.c.f. of gas.

Channel Drilling Opposed

CORPUS CHRISTI.—Oil wells and ships don't mix.

At least that is what shipping interests claimed as they opposed the drilling of oil wells within 2,500 ft. of the center line of channels in Corpus Christi Bay. Oil interests urged a 1,000-ft. rule at a hearing conducted by Col. Ellsworth I. Davis of the U. S. Army Engineers.

The hearing was on application of Stanolind Oil & Gas Co., Phillips Petroluem Co., and Atlantic Refining Co. for permits to drill in the bay.

Representatives of shipping interests urged the 2,500-ft. minimum distance on grounds of the danger of possible oil well blowouts and interference of derrick lights and flares with navigation lights.

Representatives of oil companies, the three asking permits at this time and others, expressed the opinion that a distance of 1,000 ft. would be sufficient. They questioned whether a distance of 2,500 ft. would be any more hazardous than 1,000 ft. and assured the U. S. Engineers that all precautions would be taken against blowouts.

Big Rig Launched

NEW ORLEANS.—One of the largets offshore drilling rigs ever built, was launched at Avondale Marine Ways, Inc. Built for Rowan Drilling Co., Fort Worth, the rig is constructed on a 200-ft. long submersible barge with a width of 50 ft.

The rig will be diesel-electric powered by five engines, all operated through a central control panel. It has a drilling depth of 20,000 ft.

James H. Bull, president of Avondale, said the new barge is similar to other barges in many respects, but is a self-contained unit capable of carrying a full complement and supply of pipe and other equipment, making it unnecessary to unload to move to new locations.

A special feature of the barge is the derrick-floor elevation of 20 ft. which provides a 14-ft. clearance under the rotary beam.

Refinery to Be Expanded

BATON ROUGE.—A $23,000,000 construction program at the Westlake refinery has been announced by Continental Oil Co. The massive project, will triple the present crude capacity at the plant located near Lake Charles, La.

The Westlake refinery now has a crude-oil charge capacity of 11,000 bbl. per day and a thermal cracking capacity totaling 5,500 bbl. per day, which includes 1,500 bbl. in thermal reforming capacity, alkylation production of 765 bbl., and polymerization production of 600 bbl.

Refining Jump

Capacity of 5,048,000 bbl. daily outside United States by end of 1953 indicated by current expansion plans

Dahl M. Duff

MORE than 550,000 bbl. daily was added to refining capacity outside the United States last year, but there appears to be need for still further large-scale expansion to keep pace with rapidly rising foreign production and consumption.

At the end of the year, foreign refining capacity totaled about 4,145,000 bbl. daily. This total compares with about 3,574,000 bbl. daily at the end of 1949. The figures exclude Russia and other Communist-dominated areas.

Projects which have been announced or reported in the industry indicate the prospective addition of another 289,000 bbl. daily in capacity during 1951. On the same basis, the 1952 increase will amount to about 236,000 bbl. daily, and in 1953 to about 378,000 bbl. daily. Thus, if all plans are realized, and not counting projects still to be announced, foreign refining capacity will be about 5,048,000 by the end of 1953.

Growth trend.—A somewhat narrow margin between foreign processing capacity and production appears to have been evident at the end of 1950. In December, foreign production averaged 4,573,000 bbl. daily, or, less United States crude imports of 490,000 bbl. daily, 4,083,000 bbl. daily. This is only about 62,000 bbl. daily below the total foreign refining capacity.

A more comfortable reserve of capacity existed at the end of 1949. Foreign refining capacity then amounted to about 3,577,000 bbl. daily, against a net production of 3,289,000 bbl. daily (3,740,000 bbl. daily December foreign production less United States crude imports of 451,000 bbl. daily).

These figures provide only indications of a trend since foreign refining capacity can hardly be assessed exactly. Many foreign refineries often operate well above their listed design rating. For example, the Lago Oil & Transport Co., Ltd., refinery at Aruba is reported to have had a single-day throughput in January of some 508,000 bbl., while its listed capacity is 430,000 bbl. daily.

This and other reports of sustained above-capacity operations elsewhere point out the flexible unknown in the processing ability of foreign refineries.

South America.—Most of the increase in what might be called basic refining capacity abroad during 1950 took place in South America. This area provided some 221,000 bbl. daily of the total 571,500 bbl. daily added in all foreign areas in 1950. The South American additions represented 38.6 per cent of the total.

Among the countries making major additions to refining capacity last year was Britain. Shown here are Columns C-4 and C-5 of the new 6,000-ton (42,000 bbl.) daily distillation unit added at Shell's Shell Haven refinery on the Thames.

Capacity additions in Europe in 1950 were nearly as great, amounting to 215,000 bbl. daily, or 37.6 per cent of the total. In 1951, however, scheduled additions to capacity will be concentrated in Europe to the extent of about 87 per cent of the total 289,000 bbl. daily of prospective increase.

The greatest increase shown in capacity of any country last year was in Venezuela. In 1950, three new Venezuelan refineries went on stream, and a substantial addition to capacity at a fourth was reported. Largest of the new refineries was the Creole plant at Amuay Bay, which began operations in January 1950. The Sinclair and Venezuela Gulf (Gulf-Texaco) refineries at Puerto La Cruz also opened in 1950.

Elsewhere in South America in 1950, capacity increases were made in Uruguay at ANCAP's La Teja refinery at Montevideo, and reportedly at the Y.P.F. refinery at La Plata near Buenos Aires. Smaller new refineries went on stream in Bolivia, Trinidad, and Brazil.

Presently announced and reported projects indicate a considerably less rapid expansion in South America over the next 3 years. However, continued increases in production in Venezuela likely will bring additions to existing plant capacity in that country before 1954. Brazil has two new refineries which are expected to go in operation in 1953 or 1954.

Mexico.—Mexico brought two new refineries on stream during 1950, and has plans for the construction of a west coast refinery. Improvements are being made to some of the older Pemex plants but as far as is known over-all capacity will remain about the same as now reported.

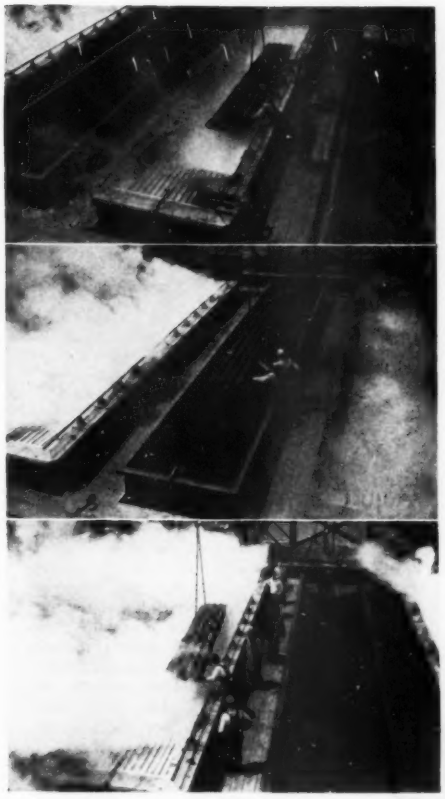
Canada.—Canada looks forward to sizable increases in refinery capacity additions during 1951 and 1952. Five new refineries are due to go on stream during the next 2 years, and increases will be provided in capacity at several existing plants. Largest of these projects is the 20,000-bbl. daily Canadian Oil Companies, Ltd., refinery near Sarnia.

Europe.—In Europe, France made improvements to most of the country's refineries in 1950 with a resulting addition to capacity of about 70,000 bbl. daily. Virtually all this was accomplished at existing refineries or in the reconstruction of war-damaged facilities.

Opening of the Caltex refinery at Bec-d'Ambes and the initial operation of the S.G.H.P. plant (Anglo-Iranian) at Dunkerque were the last of the reconstructed French refineries to be brought on stream, and further expansion probably will be confined to improvement and enlargement of existing facilities without construction of wholly new refineries.

A different situation exists in the United Kingdom which had only a minor refining industry before the war. Much of the 1951 increase in prospect for Britain—and for Europe—is in the Fawley refinery of Anglo-American Oil Co., Ltd. (Jersey Standard) which when it is brought on stream late this year with a total capacity of 126,000 bbl. daily will be the largest single processing installation in Europe.

A second major refinery still to be completed in the United Kingdom is the Isle of Grain or Kent refinery of Anglo-Iranian Oil Co., Ltd. The new Vacuum plant at Coryton will provide about 18,000 bbl. daily of capacity along with lubricating-oil facilities.



Announcing

More facilities for removing mill scale by the Phoscote Process*

three plants offer you process that improves paint bond and protects plates from rust

Three of our plants—at Chicago, Birmingham and Greenville, Pa.,—now have facilities for removing the mill scale from fabricated steel plates and shapes and applying a special primer coat of paint.

There are four steps in the Phoscote process. The steel is *first* placed in a hot sulphuric acid bath and left there until the mill scale is completely removed. The *second* step is a water rinse. *Third*, the plate or shape is dipped into a hot phosphoric acid solution. In this bath, the surface of the steel is coated with iron phosphate, which is rust-retarding and turnishes a good paint bond. *Finally*, a prime coat of paint is applied while the steel is still warm.

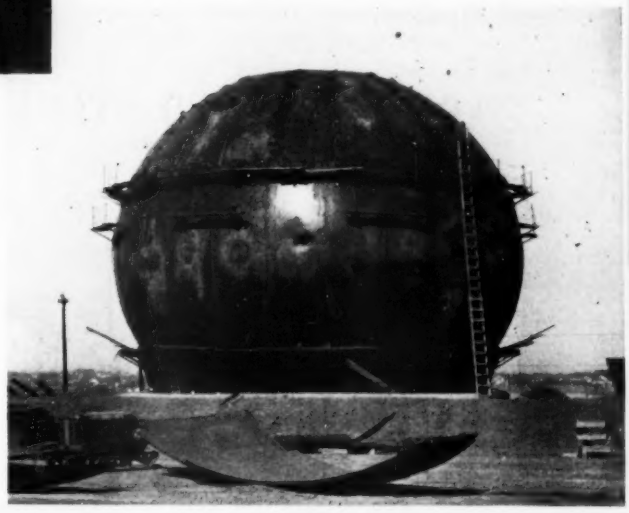
The Phoscote process makes the paint on your tanks last longer because it thoroughly cleans and prepares the surface of the plates. It also deposits a coating on the steel that improves the paint bond.

The illustrations reproduced above show:

Top view—Lowering steel into hot sulphuric acid bath.

Center view—Rinsing in wash water.

Bottom view—Removing from the hot phosphoric acid bath.



Right: One of three 20,000-bbl. Hortonspheroids being built for the Shell Oil Corporation at Cushing, Okla. All the steel used in building these Hortonspheroids were treated by the Phoscote process.

On every Phoscote job, the areas where the primer coat is damaged during shipment and erection should be cleaned and patch painted in the field before the final coat of paint is applied.

**Trade name of process used by Chicago Bridge & Iron Company to remove mill scale from steel and apply special prime coat of paint.*

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Atlanta, 3.....2154 Healey Bldg.
Birmingham, 1.....1536 North 50th St.
Boston, 10.....1025—201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg
Cleveland, 15.....2204 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Houston, 2.....2119 National Standard Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615—1700 Walnut Street Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 4.....1554—200 Bush St.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1606 Hunt Bldg.
Washington 6, D. C.....1139 Cafritz Bldg.

REPRESENTATIVES AND LICENSEES

Horton Steel Works, Limited, Fort Erie, Ontario, Canada
Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Comprimo N.V., Amsterdam—O, Netherlands
Compagnia Tecnica Industrie Petroli, Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro, Brazil

STRETCH YOUR STEEL SUPPLY ... on the drawing board

Many designers are getting more pipe from scarce tons of steel by designing with Armco Welded Steel Pipe.

This is practical because Armco Pipe is supplied in a wide range of thicknesses (⅜- to ½-inch) with diameters from 6 to 36 inches. You can match exact job requirements without the waste of excess metal.

You'll also like the speed and economy of installing Armco Steel Pipe. Lengths up to 50 feet mean fewer sections to haul and handle, fewer field joints. Even these go together quickly as the beveled ends simplify and speed field welding.

Other advantages of Armco Pipe include flexibility — slack loops and cold bends are no problem—and a high safety factor against internal and external pressures. Use Armco Welded Steel Pipe with confidence for gathering systems, line pipe and wherever else you need dependable oil and gas conduits. Write for complete data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3331 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Okla., Subsidiary of Armco Steel Corporation.

Export: The Armco International Corporation

ARMCO WELDED STEEL PIPE

ARMCO

Italy, where 43,000 bbl. daily was added in refining capacity in 1950—most of it at the Socony-Vacuum partially-export Naples refinery—is getting two completely new refineries, one the Condor plant near Milan and the other the Caltex-Fiat project at Trecate.

Other new European refineries due to go on stream over the next 3 years include the Anglo-Iranian-Petrofina plant at Antwerp, Belgium, the Esso plant also at Antwerp, and the refinery which two German oil companies are building in the Emsland to handle domestic production from this region.

Middle East.—Egypt, the eastern Mediterranean, and the Persian Gulf now have a refining capacity of nearly 970,000 bbl. daily. Only minor additions were made in 1950.

Newest plant in the area is the Kuwait Oil Co., Ltd., 25,000-bbl. topping unit at Ahmadi which went in operation in 1949. Future additions are anticipated in 1953, and of these, the most definite is the announced Standard-Vacuum project at Durban in South Africa. Besides the government projects in Iraq and Egypt, other governments have been studying refinery construction. Turkey has long planned a refinery for its indigenous production, and Trans-Jordan announced some time ago it was considering a plant to use Tapline crude.

Far East.—Most of the addition in refining capacity in the Far East and Southeast Asia last year was due to the rehabilitation and reopening of the Pacific Coast refineries of Japan. Originally slated in part for reparations, these refineries were authorized to resume operations in 1949 and were reopened last year after reconstruction of war damage and other repair following nearly 4 years of idleness.

Unsettled political conditions in many parts of the Far East make it unlikely that any major expansion of refineries will be undertaken soon in this region. Efforts to rebuild the major refinery at Rangoon, Burma, have been abandoned, and in Indonesia, the northern Sumatra refinery of Shell at Pangkalan Brandan was last reported still inaccessible. A recent report from Seria, British North Borneo, said that the uncertain outlook had caused suspension of plans to build a major new refinery in this area.

Obviously, the total of capacity to be added in the next 3 years will be changed as some projects are added to the list and others dropped. Often increases in plant capacity are made by rearrangement of existing facilities and do not show up except in annual tabulations from company reports. Projects now tentative may become definite. One example is in the Caribbean area, in Puerto Rico, and the Dominican Republic, where negotiations for new refineries have been undertaken.

Ownership.—Of incidental interest in connection with foreign refining capacity is the fact that approximately 389,000 bbl. of the 4,145,000 bbl. daily total consists of plants wholly government owned and operated. Of this, 189,600 bbl. daily is in Mexico, and some 115,000 bbl. daily in Argentina.

The 389,000 bbl. daily total does not include the partially government operations such as in Italy and Spain, or the stock interest held by governments in various operating companies, including Anglo-Iranian and C.F.R. in France. The government-owned refineries will be augmented in August when the Tropical plant of 25,000 bbl. daily in Colombia passes to government ownership, though operation will continue to be under International Petroleum Co., Ltd. Nationalization of Anglo-Iranian Oil Co., Ltd., also will put its Abadan refinery, 500,000 bbl. daily capacity, in the government-owned column.

The table shows by name only those foreign refineries which have added to capacity in 1950 or are scheduled for expansion or construction during the next 3 years. The tabulation is based on announced projects and reports in the industry. Capacity of other refineries which as far as is known are not due for expansion is listed in aggregate as "others."

Refining Facilities Outside United States

NORTH AMERICA

Company and plant—	Capacity (thou. of bbl. daily) Present	Added in 1950	Prospective expansion in 1951	1952	1953
Canada:					
British American, Montreal, East	46.5	14.5			
Shell, Montreal East	25.0	11.0			
British American, Moose Jaw, Sask.	6.0		4.0		
Sask. Federated Co-operative, Regina	2.0		3.5		
Imperial, Sarnia	52.0			19.0	
Canadian Oil Cos., Froomfield, Ont.				20.0	
Imperial, Winnipeg			12.0		
McCall-Frontenac, Edmonton			5.5		
British American, Edmonton			5.5		
Supreme Refineries, Ogden, Alta.			1.0		
Excelsior, Lloydminster	2.0		3.0		
Others	208.9				
Total	342.4	25.5	34.5	39.0	
Mexico (all Pemex):					
Salamanca	30.0	30.0			
Reynosa	5.0	5.0			
Salina Cruz					30.0
Others	154.6				
Total	189.6	35.0			30.0
Cuba (total)	7.3				
Total North America	539.3	60.5	34.5	39.0	30.0

SOUTH AMERICA

Company and plant—	Capacity (thou. of bbl. daily) Present	Added in 1950	Prospective expansion in 1951	1952	1953
Netherlands West Indies:					
(Aruba and Curacao), total	657.0				
Trinidad:					
Brighton Terminal (Barber Oil), Brighton	4.0	4.0			
Others	100.0				
Total	104.0	4.0			
Venezuela:					
Creole, Amuay	60.0	60.0			
Shell, Cardon	75.0	25.0		65.0	
Venezuela Gulf, Puerto La Cruz	30.0	30.0			
Sinclair, Puerto La Cruz	35.0	35.0			
Phillips, San Roque				2.0	
Others	116.6				
Total	316.6	150.0		67.0	
Colombia, total	25.9			5.0	
Ecuador, total	4.6		1.0		
Brazil:					
Conselho Nacional do Petroleo, Mataripe	2.5	2.5		2.5	
Cubatao					45.0
Refinaria de Petroleos do Distrito Federal, Rio de Janeiro					10.0
Others	3.1				
Total	5.6	2.5		2.5	55.0
Uruguay:					
ANCAP, La Teja, total	25.2	9.5			
Peru, total	35.1				
Bolivia:					
Y.P.F.B.					
Cochabamba	5.0	5.0			
Sucre	1.0		1.0		
Others	1.5				
Total	7.5	5.0	1.0		

Company and plant—	Capacity (thou. of bbl. daily) Present	Added in 1950	Prospective expansion in 1951	1952	1953
Chile:					
ENAP, Concon					15.0
Others	0.3				
Total	0.3				15.0
Argentina:					
Y.P.F., La Plata	85.0	50.0			35.0
Others	76.4				
Total	161.4	50.0			35.0
Total South America	1,343.2	221.0	2.0	74.5	105.0
EUROPE					
United Kingdom:					
Anglo-American, Fawley	23.5		102.5		24.0
Anglo-Iranian:					
Isle of Grain					40.0
Grangemouth	12.0	4.8	25.0		
Shell:					
Shell Haven	52.0	40.0			
Stanlow	40.7			30.0	
Vacuum, Coryton	4.0				17.7
Others	124.6				
Total	256.8	44.8	127.5	30.0	81.7
France:					
C.F.R.:					
Gonfreville	58.0	14.0			
La Mede	48.0	12.0			
Shell:					
Petit Couronne	46.2	14.2			
Paullac	6.6	2.6			
Berre	25.0		20.0		
Pechelbronn, Merkwiller	1.6	0.5			
Atlantique, Donges	17.0	3.0	5.0		
S.G.H.P.:					
L'Avera	30.0	2.0			
Dunkerque	9.0	9.0	13.5		
Gironde (Caltex), Bec-d'Ambes	13.0	13.0			
S.F.P., Port Jerome	40.0				12.0
Others	38.0				
Total	332.4	70.3	38.5		12.0
Italy:					
Stanic:					
Bari	15.0		5.0	6.0	
Leghorn	8.0		6.0	7.0	
IROM (AGIP and Anglo-Iranian), Porto Marghera	12.0			12.0	
Socony-Vacuum, Naples	33.0	26.0			
Industria Italiana (Shell), La Spezia	15.0	7.0		19.0	
Petroli Italiana, Ancona	10.0	10.0			
SARPOM (Coltex and Fiat), Trecate				13.0	
Condor, Rho			20.0		
Others	35.5				
Total	128.5	43.0	31.0	57.0	
Germany:					
Anglo-Iranian, Hamburg	12.0	7.0	1.0		
Esso, Hamburg	12.5		1.5		14.0
Shell, Harburg	10.0	1.5			
MAWAG, Ostermoor			1.2		
Deutsche Erdoel, Heide	1.5		6.0		
Schindler, Wilhelmsburg	2.3	1.6			
Ruhrchemie, Oberhausen-Holten				5.0	
Ruhrbau, Mulheim			2.0	2.0	
Erdoel Raffinerie, Lingen, Emsland				12.0	
Badische Anilin & Soda, Ludwigshafen	1.0	1.0	4.0		
Others	56.9				
Total	96.2	11.1	15.7	19.0	14.0
Belgium:					
R.B.P., Antwerp	2.5		8.0		
Soc. Industrielle (Anglo-Iranian & Petrofina), Antwerp			30.0		
Esso, Antwerp	1.5				25.0
Others	9.2				
Total	13.2		38.0		25.0
Netherlands:					
Shell, Pernis	77.9	20.0			
Caltex, Pernis	20.0	20.0			
Total	97.9	40.0			
Sweden, total	25.8				

Company and plant—	Capacity (thou. of bbl. daily) Present	Added in 1950	Prospective expansion in 1951	1952	1953
Spain:					
Escombreras, Cartagena	6.0	6.0		14.0	10.0
Campsa, Barcelona	0.7				19.0
Others (Canary Islands)	19.0				
Total	25.7	6.0		14.0	29.0
Portugal:					
SACOR, Cabo Ruivo	7.5			2.5	
Trieste, total	13.6				
Small plants elsewhere in Europe—Denmark, Eire, Norway	2.4				
Total Europe	1,000.0	215.2	250.7	122.5	161.7
AFRICA, NEAR AND MIDDLE EAST					
Egypt:					
Anglo-Egyptian, Suez	38.0	2.0			
Government, Suez	3.0				25.0
Total	41.0	2.0			25.0
North Africa (Algeria and Morocco), total	1.0	0.2			
Union of South Africa:					
Standard-Vacuum, Durban					10.0
Israel, total	83.0				
Lebanon, total	10.0				
Iraq:					
Government, Baghdad area					24.0
Others	2.3				
Total	2.3				24.0
Iran, total	502.3				
Kuwait, total	25.0				
Saudi Arabia, total	140.0				
Bahrein, total	162.0				
Turkey, total	1.4				
Total Africa, Near and Middle East	968.0	2.2			59.0
SOUTHEAST ASIA AND FAR EAST					
Burma:					
Burmah Oil, Chauk	2.0		2.0		
Indonesia:					
Shell:					
Pladju	74.0	0.3			
Balik Papan	27.0	17.0			
Wonodromo	2.0	0.5			
Others	64.5				
Total	167.5	17.8			
British Borneo:					
Shell, Lutong	38.0	3.0			
Australia:					
Australian Shell, Geelong					22.0
Others	17.8				
Total	17.8				22.0
China (Formosa), total	10.0				
Japan:					
Maruzen, Shimotsu	9.0	9.0			
Mitsubishi, Kawasaki	5.0	5.0			
Nippon:					
Kudamatsu	6.0	6.0			
Yokohoma	6.0	6.0			
Koa, Marifu	5.0	5.0			
Toa Nenryo:					
Shimizu	5.0	5.0			
Wakayama	10.0	10.0			
Showa, Kawasaki	5.8	5.8			
Others (indigenous crude plants)	11.7				
Total	63.5	51.8			
Pakistan, total	6.0				
India, total	5.8				
Total Southeast Asia and Far East	310.6	72.6	2.0		22.0
Grand total (excluding Communist areas)	4,161.1	571.5	289.2	236.0	377.7

Bolivian Hopes

Mixed-company plan used to woo foreign capital

BOLIVIA, where oil developement has been handled by a state organization since the Standard Oil Co. (N.J.) properties were taken over in 1937, is now making a bid for a return of foreign oil capital to the country.

Areas in the northwestern part of the country have been opened up to operations by mixed government-private companies under a law promulgated last November.

Most of Bolivia's production, currently about 1,600 bbl. daily, comes from Camiri field, southeast of Sucre, which was originally put in production in 1931 by the Jersey Standard interests. Last year, Yacimientos Petroliferos Fiscales Bolivianos made a discovery on the Los Monos structure located a short distance north of Sanandita.

The areas in the northwest, which were removed from the national reserve category are considered strictly wildcat territory. The law specifies that mixed-company contracts for their exploration and development are subject to approval of the Bolivian Congress. It was not clear whether the government or the private company would hold majority control. The mixed-company device has been favored by various governments in recent years as a means of oil development, but with some exceptions, it has not been notably successful in attracting private foreign capital.

Bolivia's present urgent need is for more production to allow full operation of new refineries at Cochabama and Sucre which were built with Export-Import Bank assistance. Domestic demand is about 3,000 bbl. daily, thus necessitating imports nearly as large as domestic production.

Large-scale exploration in Bolivia by foreign companies is considered to be justified only on the hope of the discovery of substantial reserves which would permit construction of the expensive transportation necessary for oil export.

In addition to the reserve areas opened by last November's law, Y.P.F.B. is seeking private foreign capital for the development of certain areas heretofore reserved exclusively for the government organization. Indications are that such an arrangement would be on a basis of a lease agreement with Y.P.F.B. These are the areas below Camiri and extending to the Argentine border. Bolivian officials say they are seeking "the best bargain" for development contracts.

Guillermo Mariaca, general manager of Y.P.F.B., has been in the United States recently for discussions with companies in connection with the change in the country's oil policy. German Costa has resigned as president of Y.P.F.B. and has been succeeded by Isaac Vincenti, former director of the National Police, but the change was not expected to affect the agency's operating policies.

Pike to Drill for Pauley

Two new wildcats will be drilled in northeastern Mexico as a result of a contract between Thomas P. Pike Drilling Co., Los Angeles, and E. W. Pauley.

The tests will be drilled on concession granted Pauley by Petroleos Mexicanos. They will be about 12 miles from Reynosa, Tamps., just across the Texas border and about 40 miles from the mouth of the Rio Grande.

Drilling equipment already has been moved in and operations are expected to start immediately.

Signal Sells CIMA Interest

Petrofina, Belgian refining and marketing company, has bought Signal Oil & Gas Co.'s interest in Mexican-American Independent Oil Co. (CIMA).

Signal had a one-third interest in the Mexican venture and was one of the original partners in the undertaking when it obtained the first important percentage-of-production contract from Petroleos Mexicanos early in 1949. Signal continues as one of the nine companies holding interests in American Independent Oil Co., the other major owner of CIMA.

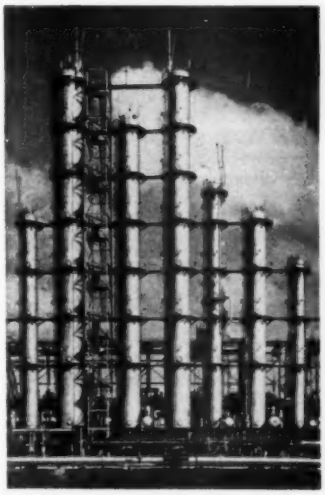
Petrofina (Cie. Financiere Belge des Petroles) earlier bought part of the interest held by E. W. Pauley in CIMA. In the last 2 years, Petrofina has taken other interests in properties in western Canada.

Baja California Wildcat

A Baja California wildcat will be spudded in soon by Pike Drilling Co. de Mexico. The well site is 600 miles below the California border and several miles inland from San Ignacio Lagoon.

The company has spent 2 months moving equipment to the remote site and rigging up. The well is a test being drilled under contract for Petroleos Mexicanos in a hitherto unproven territory.

Equipment was shipped from Long Beach, landed on the beach by barge, and hauled to the site over a road bulldozed from the beach. It includes a 10,000-ft. rig.



Non-Communist Defense Plant

Oil-industry installations such as this are vital in the defense effort of the United States and the non-Communist West. This striking view shows the alkylation unit No. 3 at the Royal Dutch-Shell refinery at Curacao in the Netherlands West Indies. During the war these facilities at Curacao produced some 12,000 bbl. daily of aviation gasoline.

New Trinidad Topping Plant

Initial runs have been completed on Brighton Terminal, Ltd.'s, new 4,000-bbl.-daily topping plant near La Brea in Trinidad.

Equipment consists of a 3,000-bbl.-daily main fractionator, a flash tower, and a new 5,000-bbl.-daily furnace. The fractionator was acquired from the old Kern Trinidad Oilfield, Ltd., plant and modified for the Brighton operation.

The newly constructed plant is adjacent to Brighton's old three-still batch plant which processes about 1,500 bbl. daily and is used to reduce fuel oil "C" to flux oil. This latter is supplied to Trinidad Lake Asphalt Operating Co., representing the British Previte interests. The batch plant will use bottoms from the topping operation. Chicago Bridge & Iron erected the equipment for the new Brighton plant. Brighton Terminal is a Barber Oil Corp. subsidiary.

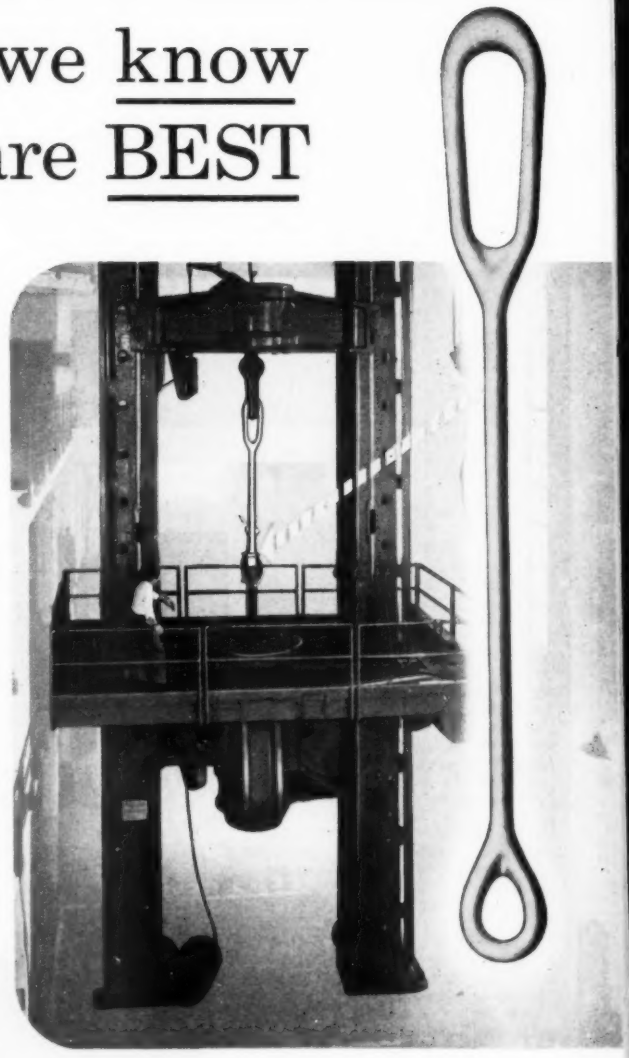
Pancoastal Plans Revamping

Directors of Pancoastal Oil Co., C.A., have announced a plan for reorganization of the company which will be submitted to holders of voting trust certificates soon.

Under the plan, present certificates would be exchanged for those representing shares of a new Canadian company, Canada Southern Oils, Ltd., and a new Venezuelan company.

The Canadian company's assets con-

Here's why we know these links are BEST



Only a test to destruction justifies the recommended load capacity and assignment of the 4 to 1 safety factor for Web Wilson FORGED Elevator Links. Links of each shank diameter, taken at random from stock, are *tested to destruction* on the Baldwin-Southwark Testing Machine (at right) which is capable of exerting a force of 4,000,000 pounds.

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Next follows heat treating to exacting standards in modern *vertical* furnaces to avoid warping or distortion—then each link is carefully "Magnafluxed" to assure uniform quality and freedom from *any* imperfections.

That's why we *know* that Web Wilson FORGED Elevator Links are BEST—that's why we can proudly say "They are the strongest 'link' in your drilling string."

WEB WILSON *forged* ELEVATOR LINKS

Shank Diameter INCHES	*Rated Capacity TONS PER LINK*	
1¾	65	*Lengths from*
2¼	110	*36 inches to*
2¾	150	*108 inches*

Tops in the field, WEB WILSON *Forged* ELEVATOR LINKS *today* provide *extra strength, extra safety and extra value* for heavy duty service and severe usage.

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Web Wilson FORGED Elevator Links are made from SAE 414OH steel which is considerably harder and more expensive to forge and heat treat than the steel used in other makes of links. You will find it worth while to refer to the chemical analysis of SAE 414OH steel, which is as follows: Carbon, .35 to .45; Manganese, .70 to 1.05; Chromium, .80 to 1.10; and Molybdenum, .15 to .25. Hardenability of SAE 414OH steel runs from 39 to 55. With a Brinell hardness of 350, the tensile strength is approximately 200,000 psi for SAE 414OH steel. Higher tensile strength; greater resistance to shock; higher toughness resulting in better resistance to wear—all vital factors in an elevator link—amply justify your approval and specification of Web Wilson Links over competitive makes.

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sist of Pancoastal's interest in Alberean Oil Corp. and Pan Western Oils, Ltd., in Canada, and Manabi Exploration Co., Inc., in Ecuador. The new Venezuelan company would have the properties of Pancoastal in Venezuela as well as interests in the United States.

MIDDLE EAST

Iranian Stalemate

Anglo-Iranian offer to arbitrate refused

ANGLO-IRANIAN OIL CO., LTD., has invoked arbitration clauses of its 1933 concession contract, but the Iranian Government has indicated it will reject this proposal as it has earlier protests against nationalization of the company's properties.

The company's request to arbitrate the threatened cancellation of its concession was made in a letter delivered to Iranian authorities in Teheran by Richard Don, the company's chief representative.

The company nominated Lord Radcliffe, well-known British attorney, who in 1947 helped settle boundary disputes between India and Pakistan and who last year arbitrated a disagreement over the extent of the Qatar concession of Iraq Petroleum Co., Ltd.

Offer refused.—The Iranian premier, Mohammed Mossadegh, however, refused the arbitration offer with the statement that nationalization is the sovereign right of any nation. The premier has made it plain he believes the 1933 contract was negotiated under duress and is invalid. On this basis, he has said the company must refund to Iran the rebates which it has given in the past on oil sold to the British Navy at below prevailing prices.

Most members of the nationalization commission have been appointed, and the next move is expected to be some attempt of the government to take control of the properties. The government has indicated it would cancel the visas of British employes of the company if its demands for an accounting are not met. This would make the employes virtual government hostages. The London Economist last week said Britain is ready to use troops if necessary to hold the fields and refineries.

Iraq negotiations.—A report from Washington this week said that Gulf Oil Corp. and Anglo-Iranian, joint owners of the Kuwait concession, are near an agreement on increased government participation in the Kuwait company. Negotiations have begun in Iraq on Iraq Petroleum's 50-50 offer to the Iraq Government.

Aramco Makes New Strike

A new discovery has been made by Arabian American Oil Co. at Ithmaniya about 40 miles south of Ain Dar field in Saudi Arabia.

The company said the oil from the new area is sour and that it was found at depths comparable to other producing fields in Aramco's concession area. Ain Dar and Abqaiq, other major Aramco fields, produce at about 5,600 to 6,800 ft.

The new well is about 20 miles west of the city of Hofuf. Aramco said the extent of the new area is as yet unknown.

EUROPE

Italian Plant Approved

WASHINGTON. — Construction of an $18,670,000 plant for the production of olefins by Montecatini Co. at Ferrara, Italy, has been approved by the Economic Cooperation Administration.

ECA will contribute $2,762,000 for the purchase of equipment available only in the United States and for American engineering services needed in construction and inital operation.

The plant will be built by M. W. Kellogg Co., New York, which shortly will ask for bids on the U. S. equipment, which will consist of an olefin production unit and a chemical derivation unit.

The plant is designed to have a capacity of about 10,000 metric tons a year of ethylene, about the same amount of propylene, and minor amounts of butylene and liquid and gaseous byproducts. The chemicals to be produced include acetone, butadiene, and styrene monomer, polyethylene and diacetone alcohol, with some amounts of dichloroethane, polystyrene, vinyl chloride, ethyl chloride, isopropyl alcohol and octyl phthalate. The only other similar plant in Europe is located in England.

It is expected that the Montecatini plant will be completed and ready for operation within 2 years.

Diplomacy in Saudi Arabia—Aramco Version

Diplomats in the state department might well profit from a study of the success currently being enjoyed by Arabian American Oil Co.'s foreign-relations program in the Middle East. While the world feels rumbles of public dissatisfaction in Iran and Iraq with policies of British oil companies, it is significant to note that Saudi Arabia expresses content in its dealings with Aramco. This is not entirely due to more liberal royalties. A great deal of the credit must be laid to the company's foreign-service training center at Westhampton, L. I., where each employe is taught rudimentary Arabic and given a thorough training in life and customs of the people. The group shown above comprises the 100th class trained at the center. Since the indoctrination school was opened in October 1948, more than 680 Aramco employes destined for Saudi Arabian service have attended classes.

Dollars in the air don't make sense!

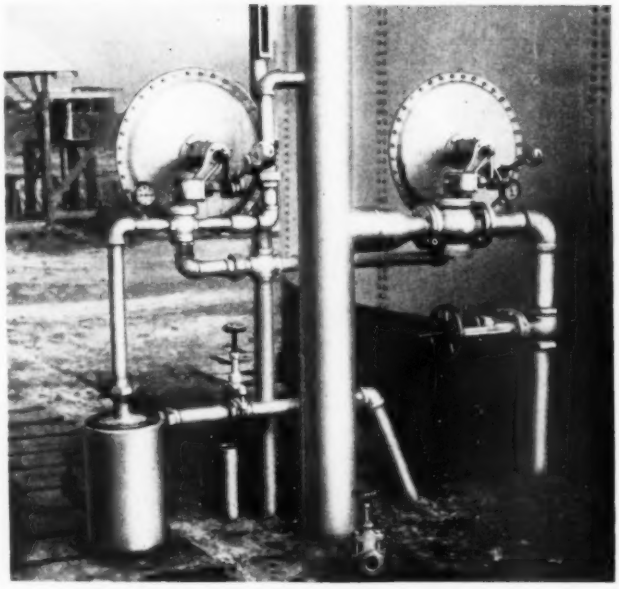
Vapors normally escaping through breathing and filling losses are literally dollar laden. These are the vapors that may even contain more rich light ends than given off at the well head. These are the vapors that when delivered as natural gas now have a greater dollar value than ever before.

"Varec" Vapor Recovery Systems have always been popular in producing areas where there are natural gasoline facilities and pipelines to the markets for natural gas. Now with the advent of more and more gasoline plants and gas pipelines, vapor recovery systems for field tank installations are even more practical.

Each installation requires an engineering analysis for its economics. Under proper conditions, full equipment payoff can be made in a few short months. The Vapor Recovery Systems Company has pioneered in the equipment for such installations. "Varec" field Service Engineers stand ready to assist you . . . call one in today!

The pulse of a vapor recovery system is its two regulators, the "Varec" Wet Gas Regulator (Fig. No. 180, Right) which permits the valuable vapors to pass into the collecting line; the "Varec" Dry Gas Regulator (Fig. No. 181, Left) which permits an even pressure to be maintained in the tank battery for stabilization of the stored product and safety against fire hazard.

P-17



4 Economic Features of Vapor Recovery:

1. Allows for recovery of valuable light hydrocarbons.
2. Natural gas saved has dollar value.
3. Stored product has increased value because of increased gravity.
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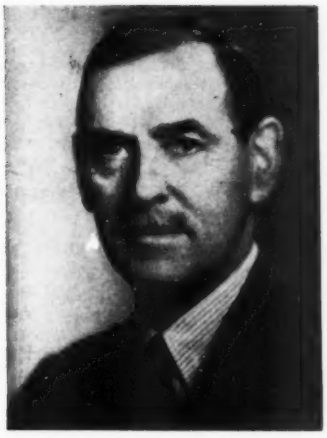
PERSONALS



36 Years Service

Dunkley is veteran in Middle East operations

G W. DUNKLEY, recently appointed executive director of Iraq Petroleum Co. and associated companies, has been engaged in Middle East operations since 1914.

He joined the London office of Anglo-Persian in that year, after attending St. Albans School and Pembroke College, Cambridge. He served in the Royal Marines during World War I and was awarded the Order of British Empire for services at the Admiralty.

In 1919 he rejoined Anglo-Persian and served 4 years with their agents in India and 8 years in Persia.

In 1931 he joined Iraq Petroleum as the company's agent in Iraq, Palestine, Transjordan, Syria, and Lebanon. He was appointed general manager in the Middle East in 1935 and was transferred to the London office shortly before the outbreak of war.

In July 1940 I.P.C. loaned Dunkley to the War Office as a member of the Standing Committee on Army Administration.

In January 1942 he joined the office of the Minister of State as petroleum adviser in the Middle East, returning to I.P.C. in January 1944.

As a member of the management in London for the past 7 years, Dunkley has had a large share in the planning and construction of the 16-in. pipe lines from Kirkuk to the Mediterranean, and of the 30-in. line to Banias, on which construction has recently commenced.

Joseph H. Guy has been elected a vice president of Crystal Refining Co., Carson City, Mich. He will be in charge of the transportation and crude-oil purchasing.

Burton Veteto, geological engineer for Malco Refineries, Inc., has been transferred from Breckenridge to San Angelo, Tex.

Rex G. Baker, director and general counsel of Humble Oil & Refining Co., this week was elected a vice president of the firm. Other vice presidents elected at the meeting of stockholders were **H. W. Ferguson** and **Moran J. Davis. Dr. Richard J. Gonzales,** chief economist, was elected a director. Baker, who has been in the law department since 1920, was elected a director in 1943. Ferguson was in the refining department from 1924 to 1945 and was elected a director in 1945. Davis, who has been in the exploration department since 1925, was elected a director in 1948.

Frank E. McMillin, independent producer, has been elected executive vice president and general manager of Hugoton Plains Gas & Oil Co. McMillin entered the oil business with Empire Gas & Fuel Co. of Bartlesville, Okla., right after the first World War. He later became a drilling contractor and an independent producer.

John E. Swearingen has been elected a member of the board of directors of Stanolind Oil & Gas Co. Swearingen, who has been with the firm since 1947, has spent most of the time in the company's Tulsa office. For 13 months he was manager of Stanolind's Central division at Oklahoma City, returning to Tulsa last February to begin a new assignment. Before joining Stanolind he was with Standard Oil Co. (Ind.) for 8 years.

DeWitt T. Ring, formerly vice president of Preston Oil Co., has joined Waverly Oil Works as a vice president and director. **G. Allan Reid,** president of South Penn Natural Gas Co., will serve on Waverly's board as a director.

G. M. Harper, Jr., formerly field engineer for Sunray Oil Corp. at Lake Charles, La., has joined Union Oil Co. of California at Abbeville, La., as corrosion engineer.

A. L. Reasor, district superintendent in charge of drilling and production for Helmerich & Payne, Inc., has been transferred from Stroud, Okla., to Great Bend, Kans.

Robert B. Clark, formerly with Texas Gas Transmission Corp. at Washington, Ind., has joined **Chester C. Clark,** consulting geologist at Shreveport, La., as reservoir engineer.

William Greenfield, plant foreman for Phillips Petroleum Co. at Buckeye, N. M., has been transferred to Goldsmith, Tex., in the same capacity.

A. S. C. HULTON

A. S. C. Hulton has been appointed vice president in charge of transportation and supplies for Shell Oil Co., replacing **D. B. Hodges,** who is on leave as director of supply and transportation for the Petroleum Administration for Defense. Hulton joined Shell in 1936 in the Long Beach, California, oil fields. During World War II he served in Washington in connection with petroleum transportation and supply matters, and since 1945 has handled similar functions for the Shell group of companies.

Thomas C. Borland, division engineer for Stanolind Oil & Gas Co. at Houston, has been transferred to Oklahoma City as general supervisor of drilling and production in the firm's central division.

Raymond S. Hunt, consulting geologist at Mount Pleasant, Mich., will close his Michigan consulting office May 31, and join Cities Service Oil Co. at Roswell, N. M., as district geologist on July 1. Hunt first started with Cities Service in 1924 and was transferred to Michigan in 1931. In 1936 he left the firm to join an independent oil company in Michigan as geologist, and in 1941 he entered the consulting field.

Richard K. Huey, vice president in charge of Deep Rock Oil Corp.'s production division, has been named assistant to the president. Succeeding him in his production duties is **Carl A. Houy,** who has been general superintendent since March 1950. Huey will work on special assignments involving producing properties. Huey started in the utilities business nearly 35 years ago, but moved to Oklahoma and switched to oil in 1915, then joined Deep Rock in 1920. Houy attended Schreiner Institute and the University of Texas before he began as a roughneck with Humble Oil & Refining Co. in Texas fields 14 years ago. In 1940, he transferred to Republic Natural Gas Co. at Dallas as

PERSONALS

engineer and progressed until he was vice president of the gas division and had charge of all the firm's engineering and drilling at the time he joined Deep Rock in 1950.

A. E. DIETERT

A. E. Dietert has been appointed division geologist for Cities Service Oil Co. at Fort Worth. He joined Cities Service in 1929 as a scout at Seguin, Tex. He was transferred from the field to the Bartlesville office in 1935 as geophysicist and was named division geologist for Texas in 1941. **Norman W. Ewbank,** who replaces Dietert at Bartlesville, was employed by the firm in May of 1948. He served in the Houston and Midland, Tex., geological offices until January of this year, when he was transferred to Bartlesville.

M. H. Arveson, technical director of Indoil Chemical Co., a subsidiary of Standard Oil Co. (Ind.), has been elected a director-at-large of the American Chemical Society to fill the unexpired term of **Dr. Edgar C. Britton,** of Dow Chemical Co., who became an ex-officio member of the board of directors upon his recent election as president of the society for 1952.

Colbert H. Marshall, Oklahoma City, has been elected vice president of Ashland Oil & Refining Co. in charge of crude-oil production. The office is a newly created position. Marshall was an independent oil producer prior to joining Allied Oil Co., Inc., in 1942, remaining with the company when it was merged with Ashland in 1948.

Bert Aiguier, tool pusher for Southern Production Co., Inc., has been transferred from Opelousas to Paradis, La.

E. J. Toth, division superintendent at Bakersfield, Calif., for Shell Oil Co., has been transferred to the new division production office at Casper, Wyo., as Rocky Mountain division superintendent. **William Nielson,** Long Beach, Calif., will be exploitation engineer, with **A. H. Davis, R. G. Hawthorne, J. J. Pickell,** and **Samuel H. Paine** on his staff. **F. H. Taylor** will continue as division mechanical engineer with **Earl D. Smith** and **James H. McEver** added to his staff. **W. M. Cheney** will join the drilling department at Casper, **Homer H. Brigham** in Montana, **N. D. McCollim** at Sheridan, Wyo., **C. M. Hanline** at Evanston, Ind., and **W. C. Thompson** in Utah.

G. T. Lackey, head of New Mexico Natural Gas Co. and other affiliated organizations, has opened offices in Cheyenne, Wyo.

C. H. Atchison, formerly district geologist for Honolulu Oil Corp. at Midland, Tex., has joined British American Oil Producing Co.'s district office in Midland. He had been with Honolulu for the past 5 years.

John R. Spencer, assistant professor of petroleum engineering at University of Texas and research engineer for the Texas Research Committee, has joined Continental Oil Co. as reservoir engineer in the production department at Ponca City, Okla.

Mrs. L. H. Prichard, widow of one of the founders of Anderson-Prichard Oil Corp., has been elected a director of the firm, replacing **T. H. Marshall,** director, vice president, and treasurer, who retired May 15.

Herbert E. Fisher, formerly chief engineer in the products pipe-line department of Standard Oil Co. (Ind.), Chicago, has been named supervisor of planning in the planning and economics department of Service Pipe Line Co., Tulsa.

R. W. Gemmer, chief geophysicist for Carter Oil Co., has been elected president of the Geophysical Society of Tulsa. Other officers elected include **Craig Ferris,** partner in E. V. McCollum & Co., first vice president; **Dr. J. E. Hawkins,** research director of Seismograph Service Corp., second vice president; **J. C. Rollins,** interpreter for Frost Geophysical Corp., secretary; and **Clare N. Hurry,** geophysical operations assistant for Carter Oil Co., treasurer.

Henry L. Waszkowski has been named assistant district superintendent of Magnolia Petroleum Co.'s Healdton, Okla., producing district. He was formerly division petroleum engineer in Oklahoma City.

B. L. Jones, assistant district superintendent of Talco district, East Texas division, for Humble Oil & Refining Co., has been transferred to the London, Tex., district. He was replaced at Talco by **C. M. Hunt, Jr.,** formerly assistant district superintendent at Pickton, Tex. **Gayle B. Randolph, Jr.,** district civil engineer, has been transferred from Galveston Bay district, Gulf Coast division, to Snyder district, West Texas division. **John S. Hacker,** senior civil engineer, has been transferred to the Pickton district, East Texas division, as district civil engineer. **Wendall S. Westerfield,** civil engineer, Southwest Texas division, has been transferred to the West Texas division office as senior civil engineer, and **Dandridge W. Marston,** civil engineer, East Texas division, has been transferred to the Goose Creek district, Gulf Coast division, as district civil engineer.

NEW L.P.G.A. OFFICERS.—William S. Lander, left, newly elected president of the Liquefied Petroleum Gas Association, receives congratulations from Peter A. Anderson, outgoing president, at the organization's annual convention and trade show in Chicago. Looking on is F. N. Mabee, first vice president. Lander is president of Rulane Gas Co., Charlotte, N. C.; Anderson heads Utilities Distributors, Inc., Portland, Me., and Mabee heads Colorado Natural Gas & Fuel Co., Denver.

PERSONALS

G. Allan Nelson, geologist for The Texas Co., has been transferred from the Denver division office to Sterling, Colo.

E. B. Stewart, division superintendent for Ohio Oil Co. at Tulsa, has been transferred to Sidney, Neb., as district manager.

Vance J. Driscoll, petroleum engineer for Stanolind Oil & Gas Co., has been transferred from Lovington, N. M., to Henderson, Tex.

Charles W. Sternberg, formerly district geologist and manager for Sunray Oil Corp. with headquarters at Denver, has resigned to become an independent operator. Before joining Sunray he had been with Atlantic Refining Co. and Ohio Oil Co.

Paul H. Smith, construction superintendent for Refinery Engineering Co., has been transferred from Tulsa to Superior, Wis., in the same capacity.

Rex D. Schropp, engineer for Phillips Petroleum Co., has been transferred from Eureka, Kans., to Odessa, Tex.

James W. Rockhold, area engineer at Russell, Kans., for The Texas Co., has been transferred to Tulsa as reservoir engineer.

Jack I. Burger, gas engineer at Drumright, Okla., for Pure Oil Co., has been transferred to Dollarhide, Tex., in the same capacity.

G. G. Oberfell, retired vice president of Phillips Petroleum Co., has been given the Distinguished Service Award of the Liquefied Petroleum Gas Association for his many research and scientific contributions to the advancement of the L.P.G. industry. The citation carries with it an honorary life membership in L.P.G.A. Last week he was honored by the American Petroleum Institute's Division of Refining with the presentation of a Certificate of Appreciation for his outstanding services to the oil industry in automotive research and the conservation of natural resources. *(See The Oil and Gas Journal, May 10, page 91.)*

W. H. Creel, formerly in charge of the engineering and planning and development department for Phillips Petroleum Co., has been appointed assistant manager of the refining department. He will report to **C. C. Tate,** who was recently made manager of the department. Creel will be in charge of all manufacturing and engineering activities carried on in Bartlesville, Okla. **W. A. McCarthy,** superintendent of the Kansas City, Kans., refinery for the past 4 years, has been appointed staff assistant to the manager, with his office in Bartlesville. Succeeding McCarthy is **Harry G. Fair,** who has been assistant superintendent of the Kansas City refinery. **L. G. Molique,** who has been in charge of planning and development in the department's aviation-fuels division in Bartlesville, has been named assistant superintendent of the Kansas City refinery.

Howard W. Joiner has been appointed assistant chief mechanical engineer of Peoples Natural Gas Co. He has been serving as superintendent of Brave station, Peoples largest compressing installation. Prior to that, he was assistant chief engineer at Hope Natural Gas Co.'s Cornwell station in West Virginia.

Neil D. Falley, formerly process foreman for Stoll Oil Refining Co. at Louisville, Ky., has joined Mathieson Hydrocarbon Chemical Corp. at Brandenburg, Ky., as supervisor of the liquefied petroleum gas unit.

F. W. Holbrook, formerly exploration manager for Slick-Moorman Oil Co. at San Antonio, Tex., has resigned to do independent and consulting geological work in West Texas and the Rocky Mountain region, with offices at Midland, Tex.

Joy T. Payton, field engineer for The Texas Co. at West Columbia, Tex., has been transferred to El Campo, Tex., as special project engineer.

Walter C. Bomhoff has been appointed manager of planning and development for Equitable Gas Co., Pittsburgh & West Virginia Gas Co., Bellewood & Monongahela City Natural Gas Co., and Philadelphia Oil Co. Bomhoff joined the firm in 1926 as a clerk in the gas-measurement division. Since that time he has served in the positions of cadet engineer, distribution supervisor, assistant to distribution engineer, distribution engineer, gas engineer, and assistant manager of planning and development, the position he held at the time of his present appointment.

John G. Richards, field engineer for The Texas Co. at Midland, Tex., has been transferred to Fort Worth, Tex., as reservoir engineer.

Raymond Thompson, formerly with U. S. Geological Survey in Wyoming, has joined British-American Oil Producing Co. as geologist in the firm's Denver division office.

DEATHS

Frank B. Long, 70, retired vice president of Oklahoma Natural Gas Co., died in Tulsa May 8. From 1912 to 1927 he was associated with the late Charles Page, Sand Springs, Okla., oil man and philanthropist. In 1927 he joined Oklahoma Natural and a year later was elected a vice president. He was in charge of gas purchases and gas conservation as well as the land department. He retired February 1, 1946, after 20 years.

Stanley Gill, 51, Houston, vice president of Gillring Oil Co., died May 7. Gill, author of several books on oil production, was the consultant for the natural-gasoline plant built during World War II in Old Ocean field.

Rubert J. Linquist, 48, financial vice president of Standard Oil Co., died recently. He joined Standard in 1945 and was formerly with Reynolds Metals Co. and Curtiss-Wright Corp.

Albert M. Ballard, petroleum engineer with Fred M. Manning, Inc., died recently in Beverly Hills, Calif. He was associated for a number of years with Sun Oil Co., and later with the PAW in the Rocky Mountains. For the past several years he has supervised construction of gas plants for Manning in Texas.

C. Hamilton Wright, Sun Oil Co.'s southeastern regional manager, died May 6 at Jacksonville, Fla. He joined the firm in 1927, and was named southeastern regional manager in 1937. In 1941 he was appointed division manager at Newark, N. J., and returned to Jacksonville as regional manager 3 years later.

William D. Blackburn, 73, died last week in Houston. He joined Humble Oil & Refining Co. as a geologist in 1920 and later was geologist for Snowden & McSweeney, independent oil operators at Fort Worth, Tex.

Grover M. Ford, 61, died in Tulsa recently. During his career he was associated with Gulf Oil Corp., L. H. Wentz, Globe Oil & Refining Co., and Sunray Oil Corp. He retired 2½ years ago and was living in Springdale, Ark.

Charles C. Lewis, 85, pioneer Kansas oil man, died in Winfield, Kans., recently.

A New

Nondestructive Test For Corrosion-Fatigue Cracks in Drill Pipe

by S. A. Wenk* and H. M. Banta*

1. Magnaglo indications of severe corrosion-fatigue cracking in a section of drill pipe.

EVER had a twistoff or other corrosion-fatigue failure? If you have, you are vitally interested in corrosion-fatigue cracking. Those tiny innocent-appearing cracks which start from corrosion pits on the pipe's interior can propagate until the joint fails. Fig. 1 shows, graphically, corrosion fatigue in a very advanced stage.

The mechanics of corrosion fatigue are quite simple. A corrosion pit, caused by the action of a contaminated drilling fluid, sets up a stress raiser which results in the formation and propagation of a crack due to the flexure of the string during drilling. Since the stress conditions conducive to corrosion fatigue appear to be most severe near the ends of the joints, corrosion fatigue is most prevalent within a distance of from 6 to 8 ft. from the box and pin ends. While improved drilling techniques have caused a diminishing of the problem in recent years, it still exists in many areas.

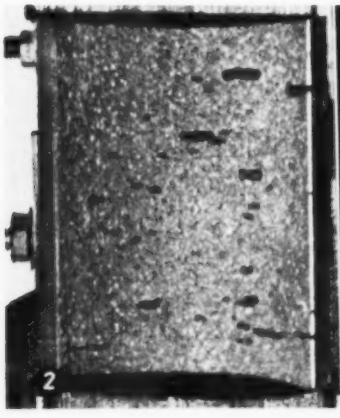
Corrosion-fatigue cracks are characterized by a regular semicircular or half-moon-shaped appearance when viewed in the plane of the crack. When viewed on the interior surface of the pipe, they are straight-line cracks occurring perpendicular to the longitudinal axis of the pipe. Under service conditions involving fatigue stresses, these cracks will grow and intersect with other cracks until the effective wall section is reduced to the point where failure occurs. Such failures have cost the industry millions of dollars in lost time spent in fishing operations, and, in some cases, abandonment of the hole has resulted.

Periodic nondestructive testing of parts which undergo high service stresses, and whose failure could be costly, has long been recognized as sound economy in many industries. Periodic maintenance inspection, properly performed, achieves maximum service life and minimum service failures. The transportation industry, in particular, has been following this inspection philosophy for years. The drilling industry has been handicapped by the difficulty of performing a positive inspection under field conditions with a minimum of equipment and time. To be successful, the method must be rapid and inexpensive, yet positive enough to avoid overinspection and border-line rejections based on uncertain standards.

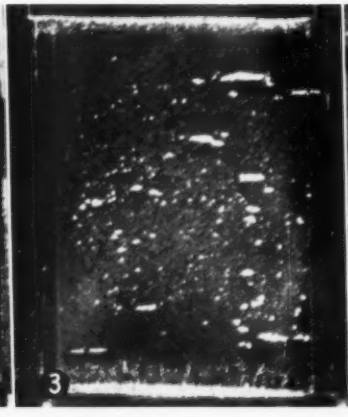
To meet this problem, Magnaflux Corp. has developed a new "Magnaglo" dry fluorescent magnetic powder and technique for the interior inspection of tubular products. This extends magnetic-particle nondestructive tests which have been ex-

*Battelle Memorial Institute, Columbus

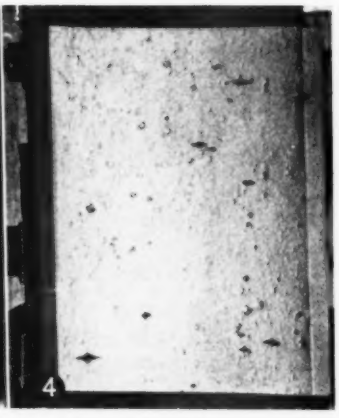
2. Black-powder indications of corrosion-fatigue cracking on laboratory sample.

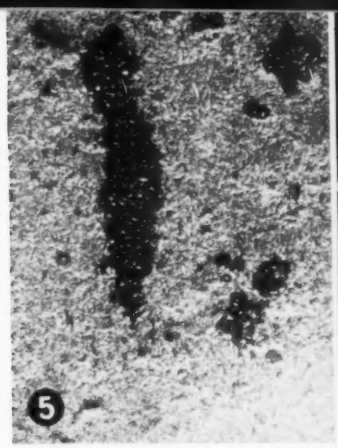


3. Magnaglo indications on same sample shown in Fig. 2.



4. Same sample shown Figs. 2 and 3 after etching with 50 per cent HCl.



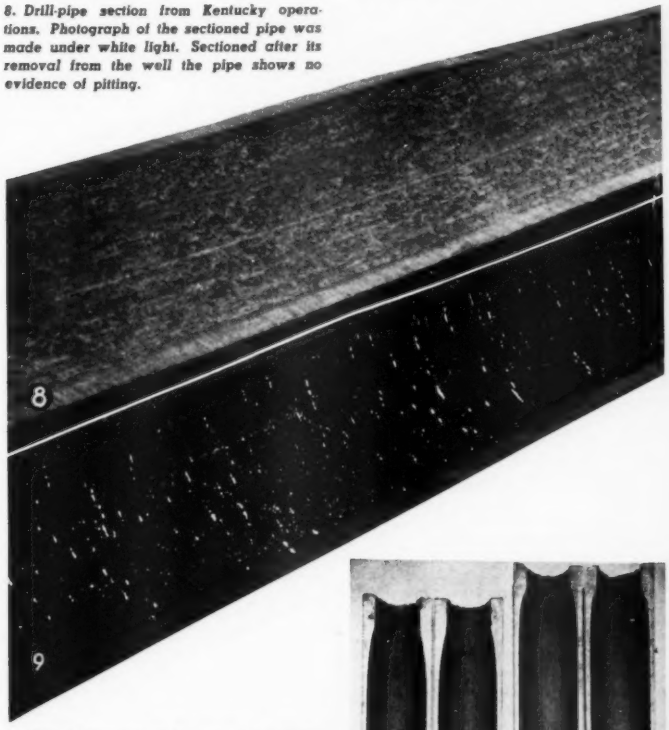


5. Black-powder indications of single corrosion-fatigue crack.

6. Magnaglo indications of same crack shown in Fig. 5.

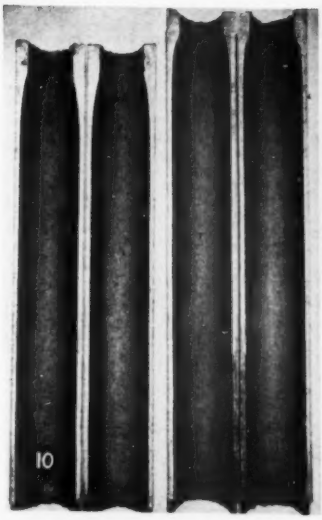
7. Section through crack indicated in Figs. 5 and 6.

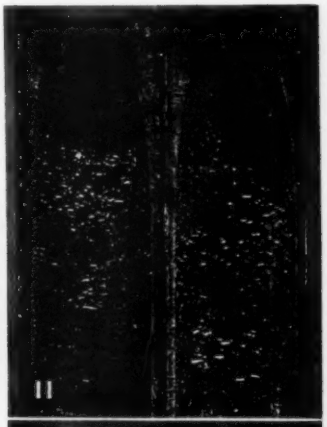
8. Drill-pipe section from Kentucky operations. Photograph of the sectioned pipe was made under white light. Sectioned after its removal from the well the pipe shows no evidence of pitting.



9. This photograph of the same pipe section shown in Fig. 8 was made under black light using Magnaglo to indicate corrosion-fatigue cracks.

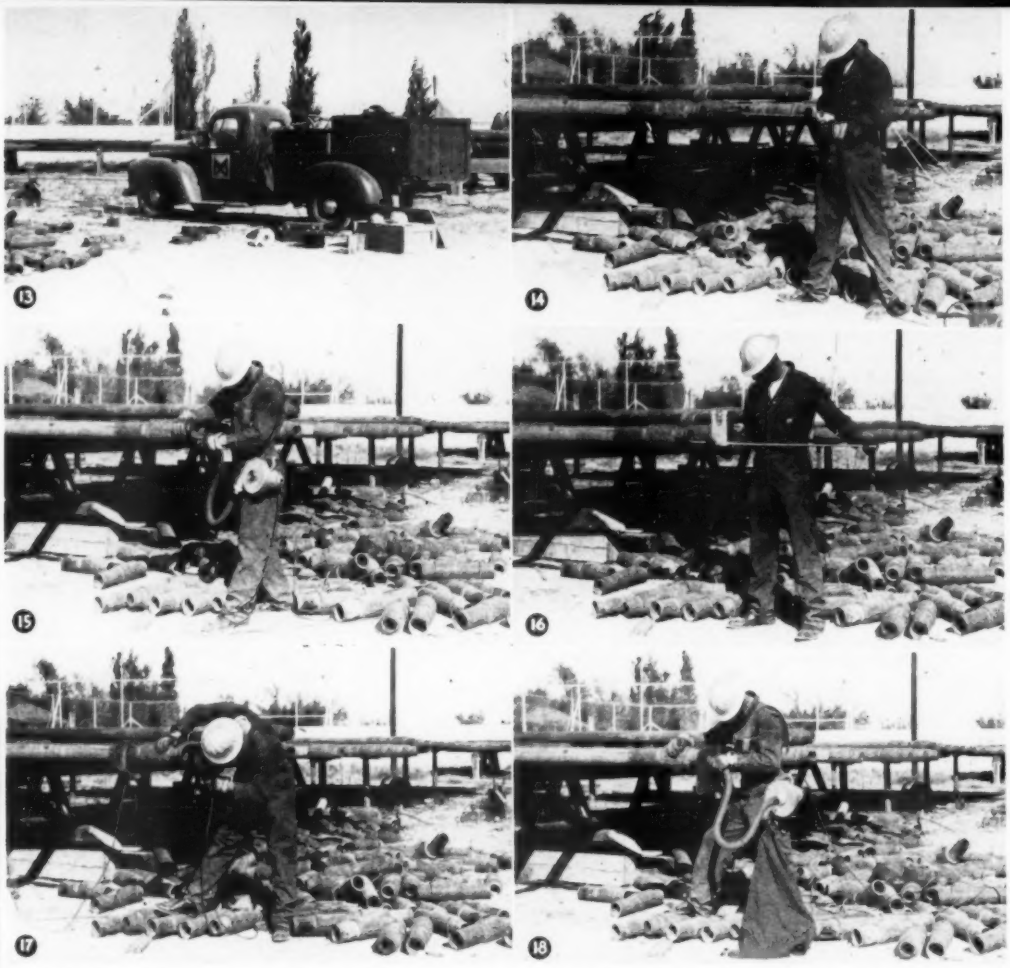
10. These two sections of drill pipe were split after corrosion-fatigue cracks were found by Magnaglo dry-powder inspection.





11. Magnaglo indications of portion of the same pipe in Fig. 10, left, as seen under black light. Cracking is distributed generally throughout the pipe length.

12. Black-light closeup of fluorescent powder indications of cracks located primarily at upset in pipe shown Fig. 10 right. The right-hand pipe shown here is sectioned from the same pipe shown in Fig. 1.



13. Equipment truck for Magnaglo powder inspection of drill pipe. 14. Here the Magnaglo technician is cleaning the pipe for fluorescent powder inspection of its inside wall. 15. After the first 6 ft. of pipe has been cleaned with a powered flail a portable blower is used to remove dirt and dust. During this operation the pipe is rolled while the blower is being used. 16. Here the technician is applying Magnaglo powder inside the cleaned ends of the drill pipe. 17. Inspection of the pipe is now under way. While the pipe is being magnetized it is rolled to distribute the powder. Here the inspector is holding the black-light lamp with his left hand. 18. By reversing the hose connection to the blower the fluorescent powder is sucked out of the pipe and deposited in a retainer similar to an ordinary household vacuum-cleaner bag.

tensively used in the petroleum industry. In conjunction with suitable magnetizing equipment, the powder particles will line up on any discontinuity which produced a flux-leakage field. When viewed under "black light", the glowing indications are very brilliant and quite easily detected. This allows rapid inspection of each joint. Furthermore, the pipe's interior surface does not require as thorough or as expensive a cleaning job for this type of inspection as it does for visual inspection. Battelle Memorial Institute is currently evaluating the method to ascertain its adaptability to the drill-pipe problem.

In the laboratory investigation, a series of tests were made to establish the sensitivity and reliability of the new Magnaglo powder. Specimens 4 by $3\frac{1}{2}$ in. were cut from several pieces of drill pipe which had been in service in a corrosive area. These specimens were examined with both the standard Magnaflux 3A black powder and the fluorescent powder. The use of black powder is rather impractical for interior surface inspection, but, since it has long been an industrial standard, it was used for the laboratory comparison tests.

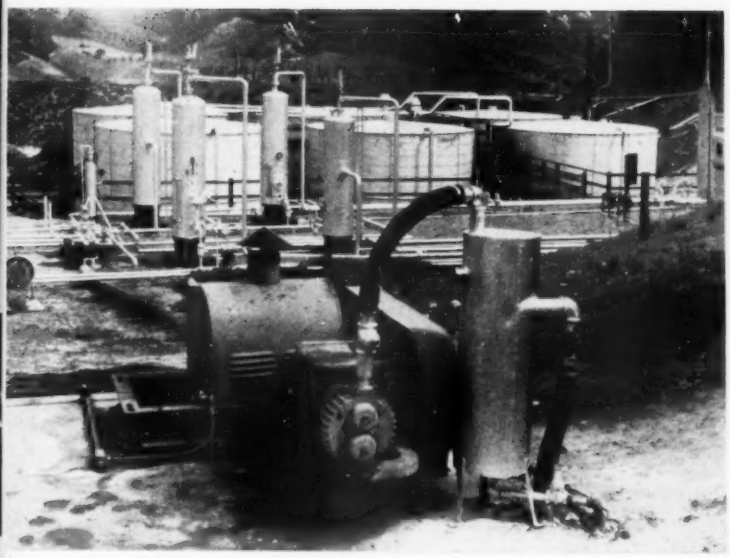
After inspection using both powders, the specimens were etched in 50 per cent HCl. The acid first attacks the corrosion products in the cracks, leaving the crack exposed. Upon comparing the cracks revealed by etching with those revealed by black powder and fluorescent powder, it was found that the powders do a thorough job of revealing all the cracks, as shown in Figs. 2, 3, and 4.

To determine how closely the powder indications revealed the true dimensions of a crack, a single corrosion-fatigue crack was selected and examined visually and with both powders. Comparison photographs are shown in Figs. 5 and 6. Measurements were made and are shown below:

	Length (in.)	Width (in.)
Visual	0.395	0.068
Black powder	0.390	0.072
Fluorescent powder	0.425	0.067

The specimen was then broken by the nick-break method to show the true length and depth of the fatigue crack. The faces of the crack are shown in Fig. 7. The length was 0.400 in. and the depth 0.154 in. In this case, as well as others investigated, the powder indicated the true length of the crack.

(Continued on page 125)



Vapor-conservation-equipped tank battery in Oak Canyon field. The small air-cooled compressor in the foreground boosts the vapors from around atmospheric pressure to a discharge of 70 psi.

Conservation of Lease-Tank Vapors

by D. H. Stormont
West Coast District Editor

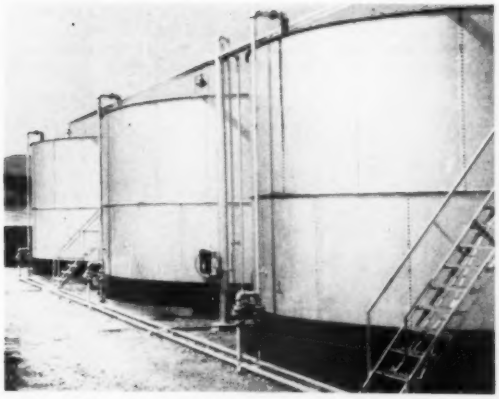
If there is any one phase of conservation techniques in which California operators excel, it is in their efforts to recover tank vapors. For years short of natural gas, most California companies have adopted these practices at all field-tank batteries possible.

The relatively high prices received for the dry gas, currently averaging between 15 and 16 cents per thousand cubic feet, of course have a decided bearing on the profitability of these installations. Income from the stripped vapors, however, often amounts to less than 10 per cent of their total value. Representing the "cream" of the produced gas, tank vapors in some California fields yield more than 15 gal. of propane and heavier per thousand cubic feet.

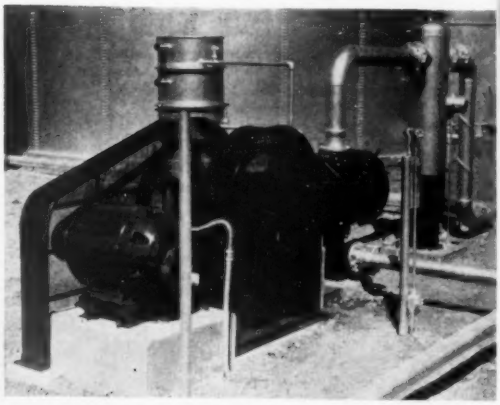
The accompanying article offers some idea of the costs of equipping lease tankage with vapor-saving devices, and of the value of the gas and products recovered by several installations. In two subsequent articles, general design and operating considerations will be discussed.

BECAUSE of shortages of natural gas, California operators have become highly aware of the importance of conserving vapor from lease flow tanks. From the viewpoint of conservation, these practices are highly commendable. From the economic viewpoint, nearly all are highly profitable, because the vapor collected represents the "cream" of the produced gas.

The additional gas and gasoline fractions recovered by these systems in many instances have paid for the installation costs in from 2 to 6 months. In some of these, this quick return was made even though compression equipment had to be installed at each battery. At other systems, where relatively little gas is



In the South Cuyama field vapor-recovery equipment is installed on practically all batteries. Vapors from the individual tanks are collected in the overhead balance line and pulled through the takeoff line by the suction of a nearby compressor.



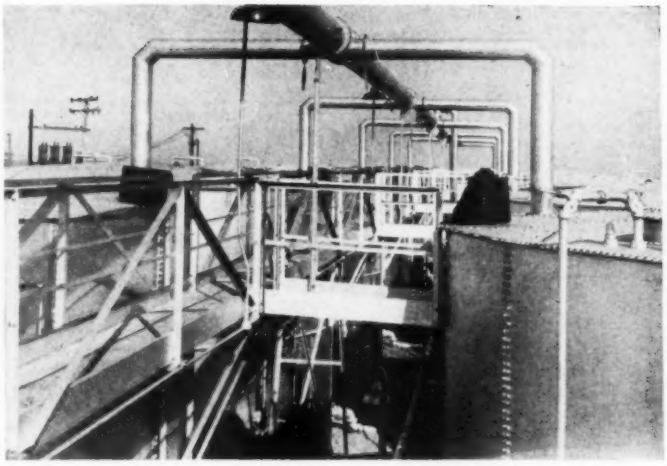
Recently installed single-stage, single-cylinder compressor at a South Cuyama battery. Electric power drives the 25-hp. motor. Accumulator on intake line is equipped with mercury high-level switch to prevent liquids being pulled into compression cylinder.

available or it is low in gasoline content, longer payouts were required.

Aside from the added natural gas and gasoline income made possible by such installations, they also tend toward conservation of oil gravity. In some cases gravity increases of 0.5 A.P.I. or more have been traced directly to these practices. Furthermore, through eliminating the vapors being flared or air being pulled into the tanks, the systems greatly reduce fire and explosion hazards.

In some instances where vapor collection is practiced on a field-wide basis, the vapors amount only to about 1 per cent of the total gas processed in the gasoline plant serving the field. The recovered vapors yield about 10 per cent of the plant's natural-gasoline and L.P.G. production.

This point is illustrated by Richfield Oil Corp.'s operations in North Coles Levee field. There, during January, 524,600 bbl. of crude were produced, stage separated at 480 and 30 psi., and vapors then collected from the flow tanks. As is shown in Table 1 the recovered tank vapors amounted to 17,000 M.c.f., or 32 cu. ft. per barrel of crude produced. This constituted 1.05 per cent of the field's 1,614,000 M.c.f. monthly gas production. Average liquid content of the vapors was 14.4 gal. per thousand cubic feet, accounting for 244,800 gal. or 7.5 per cent of the 3,256,000 gal. contained in all the gas.



This recovery system on a 13-tank battery in Guijarral Hills field in an average month collects about 7,000 M.c.f. of vapors. They contain about 10 to 13.5 gal. of butanes plus per thousand cubic feet.

TABLE 1—VAPOR-RECOVERY OPERATIONS IN NORTH COLES LEVEE FIELD DURING JANUARY 1951

	Monthly volume (M.c.f.)	Average liquid content, gal. per M.c.f.				Total liquid content (gal.)
		21-lb. gasoline	Butanes	Propane	Total	
Tank vapors	17,000	3.75	4.55	6.10	14.40	244,800
L.P. gas, 30 psi.	220,000	1.15	1.40	2.50	5.50	1,111,000
H.P. gas, 480 psi.	1,377,000	0.22	0.56	0.60	1.38	1,900,200
Total	1,614,000					3,256,000

TABLE 2—VAPOR-RECOVERY OPERATIONS AT RUSSELL RANCH UNIT DURING JANUARY 1951

	Monthly volume (M.c.f.)	Average liquid content, gal. per M.c.f.				Total liquid content (gal.)
		21-lb. gasoline	Butanes	Propane	Total	
Tank vapors	8,500	3.90	3.40	3.50	10.80	91,800
L.P. gas, 30 psi.	399,000	1.28	1.21	1.75	4.24	1,437,360
H.P. gas, 450 psi.	49,000	0.70	0.78	1.20	2.68	131,320
Total	396,500					1,660,480

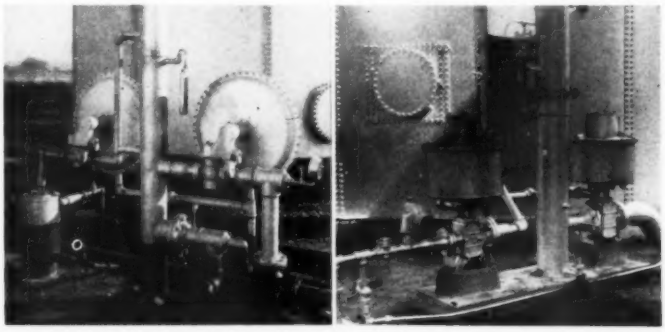
At the Russell Ranch unit in Cuyama Valley, gas-oil ratios are substantially lower and the tank vapors leaner than at North Coles Levee. In this unit during January, 484,600 bbl. of crude were produced with most of the gas being separated in the low-pressure traps. As is shown in Table 2, tank vapors recovered amounted to 18 cu. ft. per barrel of produced crude and 2.1 per cent of the total gas gathered. The collected vapors contained 5.5 per cent of all recoverable liquid hydrocarbons.

These data in both cases cover January operations. In the summer months when the volume of vapors flashed in the flow tanks is substantially greater—approximating 50 cu. ft. per barrel of produced crude at North Coles Levee—yielding an even higher percentage of the plants' natural gasoline and L.P.G. output.

Still another field in which all tank vapors are being recovered is the Newhall-Potrero, 35 miles north of Los Angeles. Almost entirely owned by Sunray Oil Corp., the field's production is either two or three-stage separated and then run to one of four batteries.

There during last October, which is about an average month insofar as volume of tank vapors is concerned, 254,800 bbl. of crude and 1,095,639 M.c.f. of gas were produced. Of the total gas volume, 13,149 M.c.f. (1.2 per cent) was recovered tank vapors, amounting to 52 cu. ft. per barrel of produced crude.

During that month 853,919 gal. of butanes and heaviers were recovered at Sunray's natural-gasoline plant. Tank vapors collected had an average isobutane plus content of about 8 gal. per thousand cubic feet which yielded about 105,000 gal. of the plant's total production. Thus tank vapors ac-



Heart of vapor-recovery systems are pressure and vacuum regulators such as these. The one on left is on a Shell Oil Co. installation at Seal Beach the one on the right is at a Richfield Oil Co. battery in South Cuyama.

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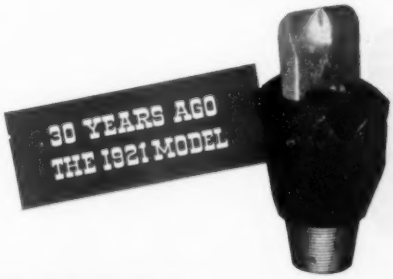
Standard unitized bit and jet bit nozzles direct slush ahead of the bit blades directly on the formation. This slush action effectively disintegrates the cuttings and removes them rapidly from the bottom of the hole. These features assure smooth running and straight, full gauge hole.



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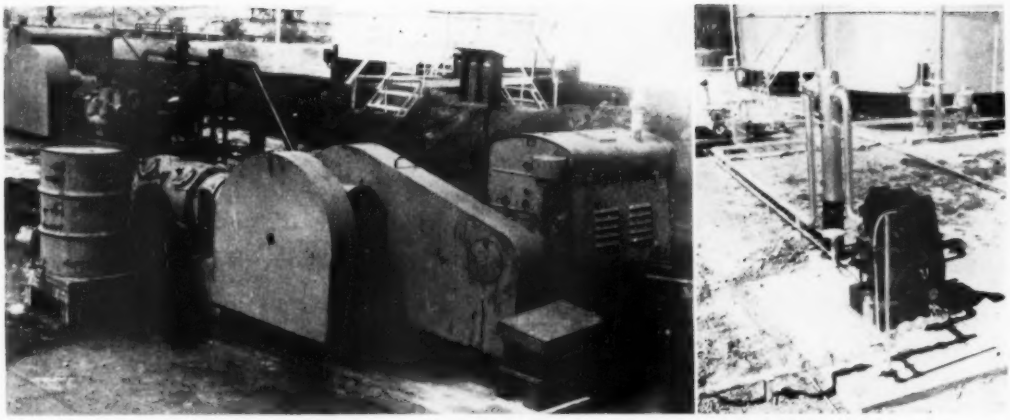

Left: Gas-engine-driven compressor serving a Sunray Oil Corp. recovery installation in Newhall-Potrero field. Right: Small air-cooled compressor driven by a 5-hp. motor at an installation in North Coles Levee field.

counted for more than 12 per cent of the butanes plus recovered although they amounted to just 1.2 per cent of the total gas processed.

Economics of Installation

The aforegoing examples show the relative importance of vapor recovery on a field-wide basis. It logically follows that while recovery of vapors is desirable from the conservation viewpoint, the installations must be economically feasible. Or if a good payout cannot be shown, at least need for reducing the danger of fire and explosion hazards must be of sufficient magnitude to warrant adding the equipment.

Prime requisites are the volume of gas available at the particular tank battery and richness of the vapors. These, of course, are determined by the gravity of the crude, gas-oil ratios, number of stages and pressures at which the oil and gas are separated, and other factors.

In regard to stage separation, theoretically, it is possible to recover all vapors if sufficient stages are used. On an economical basis, however, it is not desirable. Thus, regardless of whether two, three, or four-stage separation has taken place, if a pressure drop in the order of 30 psi. follows the last stage there will be additional vapor flashed in the flow tank.

The practice of elevating separators also reduces the volume of tank vapors available, because of the small pressure drop following separation. However, because of the crude being agitated, and especially if heat is applied to effect an oil-water separation, sufficient vapors may be available to make their recovery worth while.

In addition to the volume and richness of the tank vapors, two other factors having a decided bearing on the feasibility of a recovery project are royalty and gas-processing agreements. At some installations these two provisions are so unfavorable that they preclude a system paying out.

Cost of the equipment necessary to recover flow-tank vapors vary according to the size of the battery, volume of vapors which must be collected, whether or not compression equipment is required, and other factors. If field gas is to be used for repressuring the tanks, to exclude all air while shipping is taking place, added lines and control equipment are required. The desires of the individual operator also influence costs.

Some idea of the costs involved, and the payout obtained, can be gained from the following tabular data and "case histories." It will be noted that in these installations both costs and payouts vary widely.

Guijarral Hills.—Sunray Oil Corp., Barnsdall Division, in March 1950 installed vapor-collecting equipment at four tank batteries in the Guijarral Hills field of Fresno County. The batteries, totaling twenty-seven 1,600-bbl. bolted steel tanks, range from 3 tanks at one lease to 13 at another.

Crude production, which during the year averaged approximately 8,400 bbl. daily, is separated in either two or three stages as required with the low-stage traps being operated at about 60 psi. Gross gas-oil ratio ranges from about 1,000 to 1,400 cu. ft. per barrel; gasoline content of the field gas averages about 1.35 gal. per thousand cubic feet.

Cost of equipping the four batteries with vapor-collecting equipment, including lines and regulators for repressuring the tanks with "dry" gas, totaled $13,000. Since vacuum lines already existed there was no need for compression equipment. Cost per battery ranged from about $2,000 for the 3-tank installation to $5,300 for the 13-tank battery.

The volume of vapors recovered monthly by the four systems from the date of installation through last January, their calculated yield of butanes plus, and the estimated value of the recovered products and gas are given in Table 3. It will be noted that in the calculations no value was placed on the propane yield, and that the valuation of the gas was based on a price of 16 cents per thousand cubic feet with an allowance of 35 per cent for shrinkage and lease fuel.

Without going into the royalty and

(Continued on page 126)

TABLE 3—PERFORMANCE OF SUNRAY OIL CORP.'S GUIJARRAL HILLS SYSTEMS

	Vapor recovered (M c.f./mo.)	Liquid content (isobutane plus)	Value of liquid fractions†	Value of stripped gas‡	Total value of vapors
1950—					
March*	8,518	73,136	$4,388	$886	$5,274
April	10,554	111,084	6,665	1,098	7,763
May	14,777	133,819	8,029	1,537	9,566
June	14,776	147,008	8,820	1,537	10,357
July	15,914	191,053	11,463	1,655	13,118
August	16,082	210,482	12,629	1,673	14,301
September	13,452	168,393	10,104	1,399	11,503
October	10,583	108,642	6,519	1,101	7,619
November	11,120	110,538	6,632	1,156	7,789
December	10,896	97,808	5,868	1,133	7,002
1951—					
January	10,226	94,194	5,652	1,064	6,715
Total	136,900	1,446,157	$86,769	$14,238	$101,007

*For period March 7 to March 31, inclusive. †Estimated on basis of 6 cents per gallon for butane and gasoline content. No credit given for propane content. ‡Calculated on value of 16 cents per thousand cubic feet for dry gas, allowing 35 per cent for shrinkage and lease fuel.

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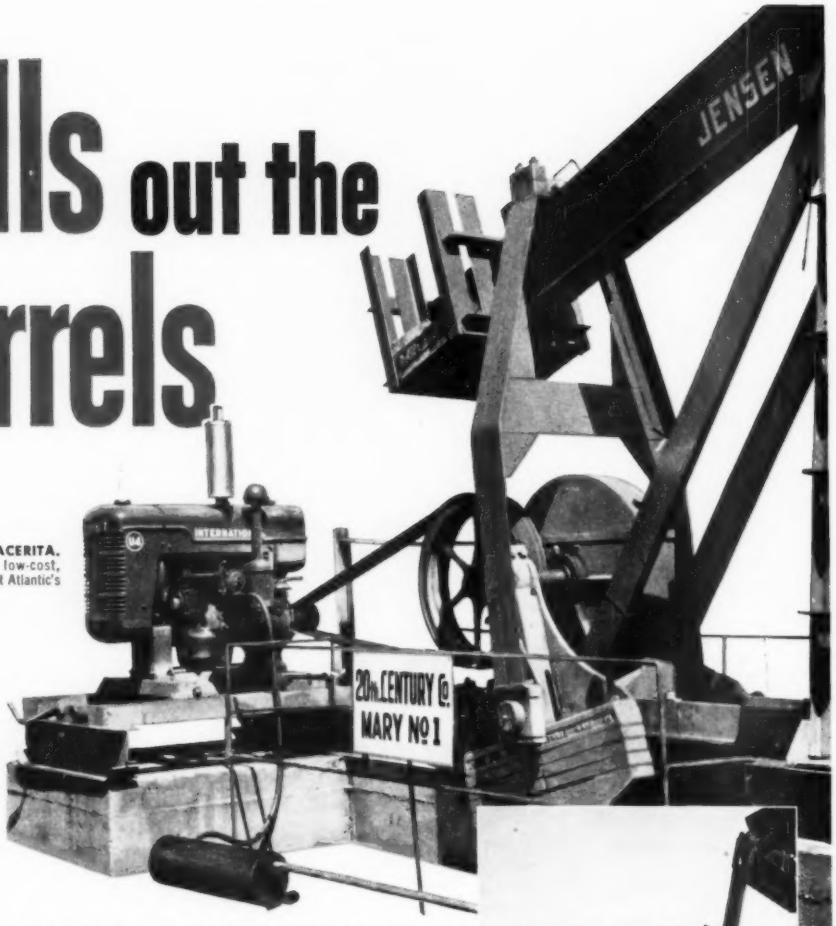

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Fig. 1—Closeup view of blisters: several small blisters in line indicate location of inclusions in the steel.

by
R. T. Effinger,*
M. L. Renquist,†
A. G. Wachter,‡
and J. G. Wilson†

How Hydrogen Attacks and Damages Steel

. . . in refinery equipment

THIS article has been prepared for the purpose of presenting the facts, as the authors know them, of the phenomena by which hydrogen damages steel in conventional refinery equipment. The paper is limited to the attack which occurs with the types of low-carbon steel commonly utilized in the construction of refinery process equipment and piping. It is also limited to the attack associated with aqueous corrosion, in which the hydrogen which penetrates the steel is a product of the electrolytic corrosion cell. In contrast to this type of attack is the attack associated with gaseous hydrogen at high temperatures, which has been thoroughly studied and reported by others.[1] [2]

It is common knowledge that hydrogen, under certain relatively low-temperature conditions, will penetrate and weaken the structure of steel, but that the environmental conditions under which this destruction takes place has not been well defined. Further clarification of these conditions is of pressing importance because available evidence shows that hydrogen attack in refinery equipment is increasing at an alarming rate. Furthermore, the problem does not appear to be one which can be solved economically by changes in the metallurgy of the steel. The greatest promise of solution seems to be in changing the environmental conditions so as to permit the use of ordinary grades of steel. It is believed that this objective can be realized if more complete understanding of the phenomena is obtained.

The work undertaken by the authors and their associates has already resulted in marked reduction of damage to steel equipment in the environments encountered to date, and it affords the means of studying environments which may present themselves in the future.

*Shell Oil Co., Martinez, Calif. †Shell Oil Co., New York. ‡Shell Development Co., Emeryville, Calif. Presented at A.P.I. Refining Division meeting, Tulsa, May 1951.

Mechanism of Hydrogen Penetration

The solubility of hydrogen in steel is appreciable, and it increases with an increase in temperature. The rate at which hydrogen diffuses through steel depends on its state. Molecular hydrogen diffuses through steel very slowly, if at all. Atomic hydrogen diffuses through steel very readily.

It is believed that the manner in which hydrogen leaks out of a blister over long periods of time probably results from the fact that hydrogen dissociates to a limited degree at any temperature, and that the atomic hydrogen thus formed leaks off—this process continuing until the pressure is lost. It is also possible that even molecular hydrogen can diffuse through steel, but at a very low rate. For these reasons it is clear that molecular hydrogen, which may be a component of the process streams, plays no part in the attack of the steel; the harmful hydrogen is the dissociated hydrogen present on the corroding surface of the steel. One factor is certain, and it merits emphasis, viz.: dissociated hydrogen can leave steel as well as enter it.

If the rate at which hydrogen enters steel is greater than the rate at which it leaves the steel, internal pressure will build up within the steel until either these rates become equal or the steel ruptures. The pressure required to rupture the steel depends on the strength of the steel which, in turn, depends on its homogeneity and physical properties.

The pressures which are required to rupture steel are of a very large order of magnitude, and the question naturally arises as to the source of such high pressures. If the steel of a vessel which operates under atmospheric pressure or under pressures of only a few hundred pounds can blister as a result of pressures of many thousands of pounds per square inch within the steel, there must be a source of energy to create such pressure. The pressure within the vessel itself is an insignificant factor. The source of this energy is the galvanic corrosion cells which exist on the surface of the steel. Steel also can be heavily charged with hydrogen by application of an external source of electric current.

Atomic hydrogen thus formed on corroding steel originates from the hydrogen ions in water. As a result of the action of such corrosion cells, a high concentration of atomic hydrogen exists on the corroding surface. From this surface it may diffuse into the steel. Donald P. Smith[3] states: "Diffusion of hydrogen cathodically liberated, which was first noted by Cailletet, 1868, has been repeatedly studied, and appears to differ from 'gaseous' type only because of the high pressure at which the diffusant enters the metal and the large concentration gradients which result."

For hydrogen to diffuse into the metal, two conditions must be fulfilled simultaneously: (1) There must be maintained a high concentration of atomic hydrogen on the surface, and this normally occurs because of the continued activity of the corrosion reaction; and (2) the surface of the steel must actively promote the ac-

ceptance of atomic hydrogen rather than catalyze the association of atoms to molecules of hydrogen gas.

When hydrogen damage occurs in refinery equipment, the atomic hydrogen is supplied by the naturally-occurring corrosion cells. Obviously, elimination of the corrosion reactions will eliminate the supply of hydrogen, and thus stop the attack. Another alternative is modification of the catalytic nature of the steel surface so as to reduce the acceptance of atomic hydrogen by the steel.

Factors which influence the rate of corrosion reactions are more adaptable to study, and are more fully understood, than factors which affect the catalytic nature of steel surfaces. Empirically, it is known that traces of certain ions, such as sulfide and arsenate, promote surface conditions favorable to the acceptance of atomic hydrogen.[2,5,10] It is suspected that the absorption of surface films and their influence upon the hydrogen overvoltage may provide a clue to the factors which influence the catalytic nature of these surfaces.[21,24]

The rate at which hydrogen diffuses through steel is affected by the condition of the metal. Highly stressed steel, such as cold-worked or welded steel which has not been properly annealed, will evidence greater penetration rates than steel in which internal stresses are of a lower magnitude.[1,5,8,9,21,25,26,30]

The Effects of Hydrogen Penetration on Steel

High internal hydrogen pressures in steel may cause blistering, fissuring, or embrittlement. The pressure which is built up in the steel will cause rupture at the weakest part. In dirty steel the weakest part may be an inclusion or lamination, whereas in clean steel the weakest part may be the slip planes or rifts within the grains themselves. Loss of ductility is caused by the high strain produced by hydrogen pressures which occur in submicroscopic voids. The hydrogen pressures which can be attained in discontinuities are of an extremely high magnitude, and far exceed the strength of the steel.

C. A. Zapffe and C. E. Sims,[28] in discussing hydrogen blistering, fissuring, and embrittlement state: "Each type of defect depends upon a certain aerostatic pressure of occluded gas for its formulation. These pressures vary from several thousand atmospheres for embrittlement down to a fraction more than one atmosphere for blistering phenomena in paints and molten enamels."

Blistering.—The occurrence of blisters in steel is the most striking demonstration of hydrogen attack, and often is the first outward indication that hydrogen damage is occurring. Unfortunately, by the time blisters are discovered, the steel has been damaged permanently.

The size and appearance of blisters in steel vary from almost microscopic bursts upon the surface to large swellings within the metal. Blisters up to several feet in diameter have been found. Fig. 1 shows a section of a typical blistered steel pressure vessel. Similar blisters occur in pipe, particularly in lap-welded pipe, and there is evidence that seamless pipe also blisters.

The mechanism for blister formation involves the conversion of atomic hydrogen to molecular hydrogen at internal discontinuities or inclusions within the steel, accompanied by a tremendous increase in volume. Most rolled steel plate is not homogeneous, and it contains traces of slag, oxide, sulfide, phosfide, gases, and other nonmetallic inclusions. In the process of rolling, these inclusions are squeezed into flat plates or bands within the steel. Such locations become the focal point for the formation of hydrogen blisters.

Atomic hydrogen formed on the corroding surface diffuses readily throughout sound steel, and forms molecular hydrogen upon reaching these discontinuities. Tremendous pressures are exerted which cause the steel to rip and tear along the relatively weak junctions of the nonmetallic inclusions. As a result, the steel is forced outward by the accumulating pressure to form the convex surface of the blister. The location and size of such blisters depend upon the locations and size of the inclusions in the steel plate. In plates rolled from rimmed steels, blisters often occur at the junction of the rimmed and core areas—which, in plates of this type, is the area of maximum inclusions.

The pressure inside blisters has been measured at several thousand pounds per square inch.[2,29] Analysis of the gas from within blisters confirms that it is pure hydrogen.

Although the hydrogen gas within blisters is essentially trapped, there is a very slow rate of hydrogen escape. Instances where vessels have blistered and subsequently been removed from the corrosive environment show that pressure inside the blisters is dissipated over a very long period of time.

Both rimmed and deoxidized grades of low-carbon steel plate have been observed to blister—although as would be expected, the cleaner deoxidized steels blister less severely than the dirtier rimmed steels.

Fissuring.—Inspection of many vessels has indicated that, even when blisters are not in evidence, a fine return of hair-line cracks may de-

READING FOR PROFIT JOURNAL CHECK CHART

Are You Up on Low-Temperature Corrosion by Hydrogen?

CHECK CHART.—Here are summarized important factors on hydrogen corrosion brought out in this article. Test your knowledge by checking each statement you are presently familiar with ("5" is excellent score, "3" is "working knowledge").

- ☐ 1. When hydrogen damage occurs in refinery equipment, the hydrogen is supplied by naturally occurring corrosion cells.
- ☐ 2. Hydrogen penetration into steel results in one of these corrosion effects: (1) blistering, (2) fissuring, or (3) embrittlement.
- ☐ 3. Although hydrogen attack may be reduced by alloy or alloy-clad steels and certain surface coatings, elimination of the hydrogen source is the only practical solution.
- ☐ 4. Greatest hydrogen damage is experienced where hydrogen sulfide is present. In solutions of relatively pure water and hydrogen sulfide little hydrogen penetration damage results. If acids are present, rapid and continuing hydrogen damage can be expected. Still greater damage occurs if cyanides and ammonia are also present.
- ☐ 5. In the absence of cyanides, hydrogen penetration in acidic hydrogen sulfide solutions may be reduced by ammonia injection. However, this method usually is too costly.
- ☐ 6. Extensive water washing of petroleum stocks causing hydrogen penetration damage is effective in greatly reducing this damage. However, washes with inadequate amounts of water may enhance deterioration, rather than relieve it.
- ☐ 7. A thin-walled, small-volume membrane type of probe has been developed to determine the rate of hydrogen penetration.

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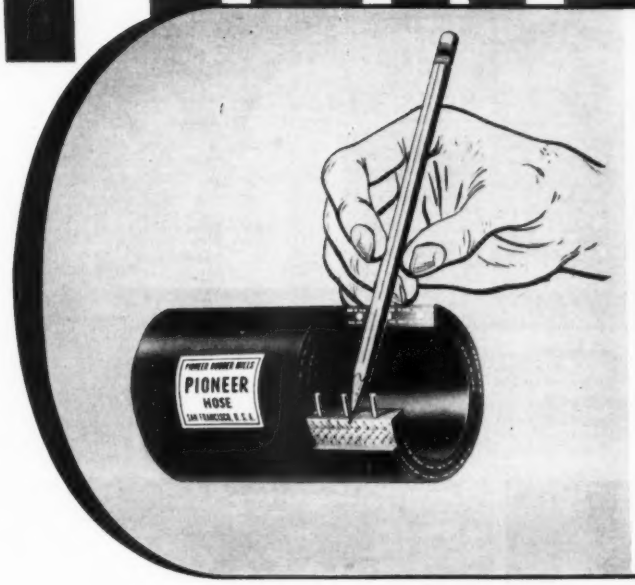

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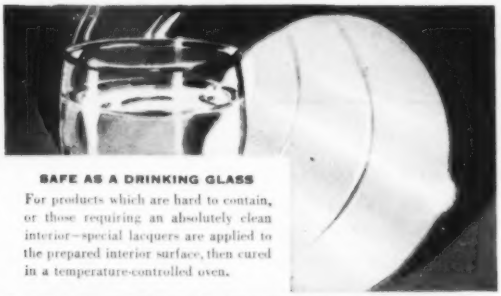

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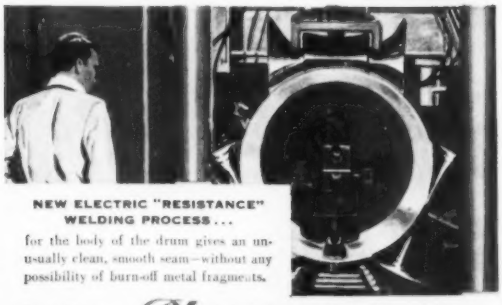

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velop upon the surface exposed to the corrosive environment.

Microscopic examination of steels from corroded vessels shows small subsurface fissures roughly perpendicular to the surface, but with no visible evidence upon the surface of the steel. These surface and subsurface cracks are not confined to the plates which exhibit blistering, and occasionally are the only evidence of hydrogen attack.

Fissures are normally oriented perpendicular to the direction of maximum stress, and thus have a maximum effect upon the strength of a pressure vessel. These observations parallel those of C. A. Zapffe and C. E. Sims with regard to flaking and fissuring.[3] These authors state: "Aerostatically stressed by the accumulating gas, these rupturing areas should be expected often to orient themselves with externally applied stresses, as an aerostatic stress operates equally in all directions, and rupture will lie in the resultant of all stresses."

It is the authors' opinion that the insidious manner in which fissures occur and the difficulty in their detection make this type of defect the most serious which results from hydrogen attack. Some success in revealing fissures by magnetic-particle inspection has been realized. Proof pressure-testing of vessels is resorted to in many cases. Development of an improved inspection technique for this type of defect is definitely needed.

Loss of ductility.—When steel is penetrated by hydrogen, it suffers loss of ductility. Inasmuch as the diffusion rate of atomic hydrogen into and out of steel are about the same, the loss of ductility of a piece of steel exposed to corrosive conditions may not be detected if the piece is tested several hours after its removal from the corrosive environment. This factor accounts for the apparent satisfactory ductility in specimens of steel removed from blistered vessels when they have been tested days or weeks after the vessel was removed from service.

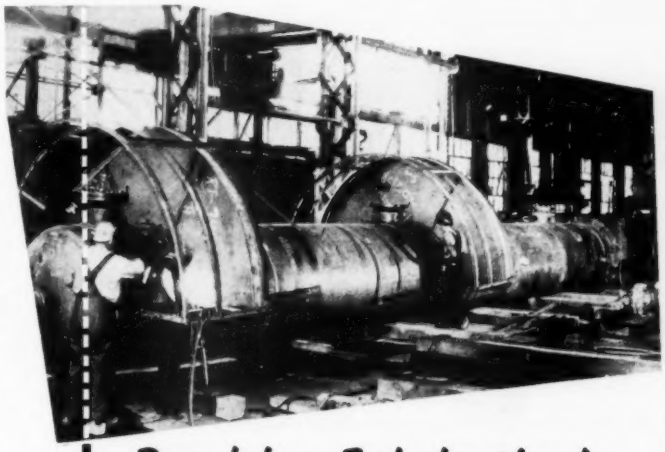
To demonstrate this embrittling effect, a piece of steel must be tested by a method which utilize a slow rate of deformation. Tensile, bend, and torsion tests amply demonstrate this loss of ductility. Testing methods which utilize a rapid rate of deformation, such as the notched impact tests, are insensitive to the loss of ductility associated with hydrogen.

The nature of the steel influences the degree of ductility lost when the steel is loaded with hydrogen. Hardened steels and cold-worked steels show a marked loss of ductility; whereas mild hot-rolled steels, such as are commonly used in pressure-vessel construction, show a less marked loss of ductility. The elongation of mild low-carbon steels which are free of hydrogen is in the order of 30 to 40 per cent. When charged with hydrogen, the same steel may show elongation as low as 5 per cent.

The loss of ductility in the type of mild steels used for refinery pressure-vessel construction might not be considered to be too serious. However, the combined effects of embrittlement and the high stress concentrations which result from fissuring or blistering are of much concern.

Materials for Construction

Refinery pressure vessels and tanks are constructed predominantly of rimmed steels corresponding to A.S.T.M. Specifications A-285 and A-7. As mentioned previously, these rimmed steels are particularly susceptible to hydrogen blistering. Killed steels corresponding to A.S.T.M. Specifications A-201 and A-212 are less susceptible to blistering, and in the past these killed grades of steel have been recommended for refinery pressure-vessel construction where blistering is encountered. However, it is now known that the use of killed steels does not provide complete assurance that blistering will be avoided because experience with these steels indicates that they will blister, but at a much slower rate than with rimmed steels. Furthermore, killed steel will fissure and lose ductility in corrod-



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ing environments which favor hydrogen penetration.

Both seamless and welded pipe are subject to hydrogen attack in the same manner as equipment fabricated from rolled plate. The effect of hydrogen penetration may be much more serious in welded pipe than in seamless pipe because of discontinuities and imperfections which may exist in the weld. Lap-welded pipe is particularly objectionable. The inspection of pipe for hydrogen damage is extremely difficult, and for this reason alone it is of added importance that the source of the damage be eliminated.

Alloys, such as monel or Type 316 stainless steel in either solid or clad construction, have been used to avoid hydrogen damage. The use of these alloys is effective because of their specific resistance to the common environments in which hydrogen damage occurs. Very little is known regarding the effects of hydrogen at low temperature upon these alloys; but it is suspected that, under conditions in which these alloys experience slight corrosion, hydrogen attack may still prevail. The use of alloy construction is expensive, and the replacement of a major portion of a plant with alloy involves a prohibitive cost.

Surface coatings which satisfactorily shield the steel from the corrosive environment should be effective in avoiding hydrogen damage. Thin protective coatings, such as the common proprietary plastic enamels, have been tried. These were found to be effective only in part because lack of adhesion and unavoidable holidays permitted the steel to come in contact with the corrosive environment.

Massive concrete linings have been quite effective in protecting steel; but, when hydrogen attack is encountered, it becomes impractical to provide this type of coating for the inner surface of all vessel and interconnecting piping. For these reasons, it is concluded that protective coatings are useful only as a stop gap in the solution of this problem.

In view of the impracticability of solving the problem of low-temperature hydrogen attack on steel by changes in the specifications of the steel or by the use of surface coatings, it becomes apparent that elimination of the source of the offending hydrogen provides the only practical solution.

Destructive Test of a Blistered Vessel

Evaluation of the effects of hydrogen damage upon the strength of pressure-containing equipment is exceedingly complex, and is not adapted to simple mathematical analysis. For these reasons it was deemed advisable to subject a blistered pressure vessel to a destructive hydrostatic test and observe the mode of failure.

The vessel selected for this test was a 54-in. diameter by 12-ft.-long pressure accumulator, with a 24-in. diameter sump. The shell plates, which were $\frac{5}{8}$ in. thick, and the sump, which was $\frac{1}{2}$ in. thick, were of A.S.T.M. A-70 steel. The vessel originally was constructed for a maximum allowable working pressure of 200 psi., with a $\frac{1}{8}$-in. corrosion allowance. It was removed from service because of severe blistering of the heads and shell, even though it had not been thinned appreciably by corrosion.

As the vessel had been stored out of service for a period of approximately 3 weeks prior to the test, it was assumed that during this storage most of the hydrogen had escaped from the steel. To recharge the steel with hydrogen, the vessel was filled with an aqueous solution known to promote hydrogen penetration. The procedure consisted of filling the vessel with water to which concentrated sulfuric acid had been added so as to reduce the pH to approximately 2 and then saturating this water with hydrogen sulfide.

To detect when the steel in the vessel was again charged with hydrogen, four 7-in. diameter steel pads were welded to the outside surface and vented through a short piece of metal capillary tubing to gas-collecting tubes. When hydrogen was detected in the gas emitted from under these pads, the vessel was considered ready for test. The corrosive

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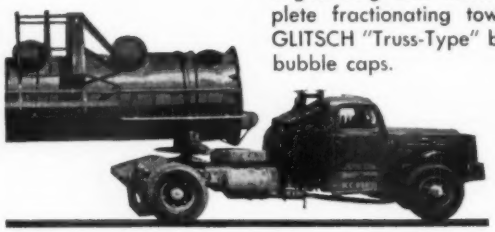

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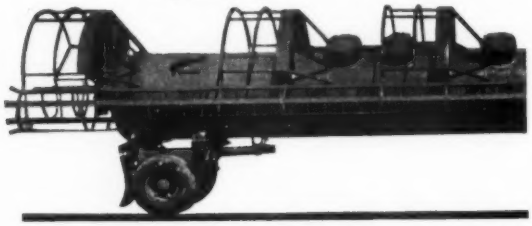

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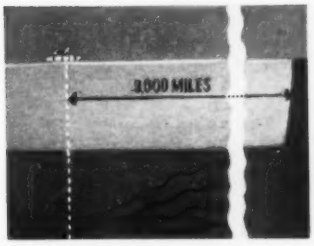

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solution remained in the vessel throughout the pressure test. Prior to the test, the external surface of the vessel was sandblasted and coated with a lime wash so as to detect the pressure at which yielding of the steel had occurred.

Pressure was applied in 25-psi. increments, and the lime coating was examined at each increment of pressure. The steel was observed to yield at about 500 psi., and rupture occurred at 800 psi. The predicted yield pressure for a sound vessel was 525 psi., and the predicted rupture pressure was 1,050 psi. The rupture occurred as a 2-in. split in the sump near the weld which attaches the sump to the shell. External observation indicated that the steel had ruptured in a ductile manner.

Examination of the interior of the vessel after testing indicated severe cracking of the steel plate near the junction of the sump and the shell. Critical examination of the steel in the sump area indicated that it had been severely fissured, but not blistered.

Survey of Plant Operating Conditions

Early in this investigation it was suspected that hydrogen attack had been considerably influenced by environment, and it seemed reasonable to suppose that a study of process conditions under which blistering had occurred might well provide the clues to an explanation of, and a remedy for, hydrogen attack.

To that end, as many as possible of the refiners who had reported blistering were visited, and from them was obtained all available information on the accompanying process conditions. This survey indicated that hydrogen blistering, fissuring, and embrittlement have been experienced in the following operations:

1. Natural-gasoline plants which process sour gas and gasoline.
2. Storage tanks used for sour gases and gasoline.
3. Gas-recovery and fractionation plants associated with catalytic cracking units.
4. Hydrogen-sulfide-removal and disposal plants.
5. Storage tanks used for strong sulfuric acid.
6. Hydrogen fluoride alkylation plants.

By far the largest economic loss caused by hydrogen damage is experienced in environments where hydrogen sulfide is encountered (the first four conditions enumerated in the foregoing list). Only a few cases of hydrogen damage in sulfuric acid storage tanks and in hydrogen fluoride alkylation plants have been reported. Although these latter instances of hydrogen damage are important and deserve study, the pressing problems were those encountered in sour hydrogen-sulfide environments; thus efforts were concentrated upon this phase, with particular emphasis upon controlling the attack in catalytic cracking gas plants.

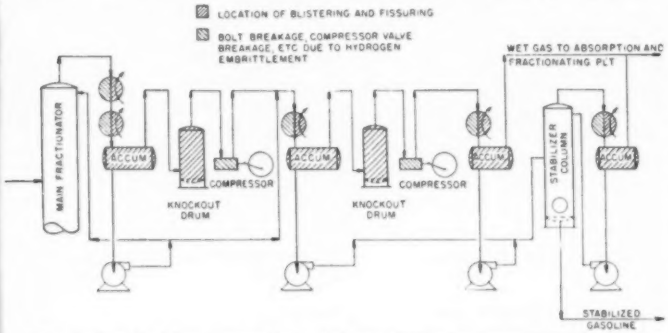

Fig. 2—Simplified flow diagram for typical catalytic-cracker gas-compression plant.

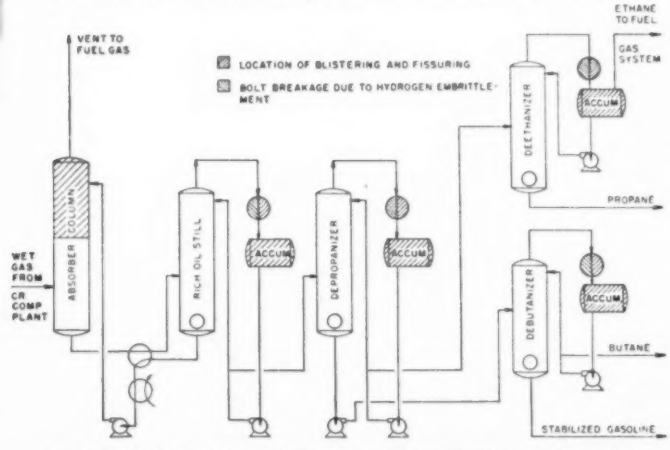

Fig. 3—Simplified flow diagram for typical gas-absorption and fractionating plant.

Catalytic Cracking Gas Plant

A simplified flow diagram for a typical catalytic cracking gas compression plant is shown in Fig. 2, and a simplified flow diagram for an absorption and fractionating plant is shown in Fig. 3. Individual plants may vary in details of equipment and in operation; but these flow diagrams represent the simplified basic features of most plants, and they are presented to indicate the locations where hydrogen blistering, fissuring, and embrittlement are likely to occur. They are presented as a composite of the experience of various refiners. No single plant has experienced hydrogen attack in all of these locations.

When all the evidence from this survey had been accumulated and studied, certain facts were established on which a program could be based. These facts are:

1. Hydrogen attack is experienced only in environments where free-water phases are known to exist, regardless of the temperature and pressure. In no instance has low-temperature hydrogen penetration, blistering, fissuring, or embrittlement been discovered where an aqueous phase is not present.

2. In all locations where hydrogen attack occurs, hydrogen sulfide is a component of the process stream. However, no correlation exists between the concentration of hydrogen sulfide and the severity of hydrogen attack. In some locations where high hydrogen-sulfide concentrations are encountered, there is no evidence of hydrogen damage.

3. The attack is observed in environments which have a wide range of pH. In some instances the damage is severe under both acidic and mild to strongly alkaline conditions. Several instances indicate that the attack occurs in strong sodium-hydroxide solutions.

4. Cyanides are suspected to be promoters of the attack, from the following observations:

(a) At many locations where the attack is severe, blue-gray deposits are formed in the equipment; and, when these are washed from the vessels and allowed to stand in the air, a deep blue (prussian blue) stain develops. Analysis of these deposits confirms that they are ferrocyanide. In other locations the distinct odor of cyanide is detected in the water layers drained from hydrogen-damaged equipment.

(b) Blistering has occurred in the stripper columns of several diethanolamine plants for hydrogen sulfide removal, and has not occurred in other similar plants. Only in those plants where blistering occurs were cyanides reported.

(c) Blistering and related hydrogen damage appear to be more severe in plants with heavier feed stocks, such as those prepared by solvent deasphalting of crude or by deep flashing, or where entrainment of heavy ends is excessive. It is established that nitrogen compounds are more prevalent in heavy crude fractions and that, in catalytic cracking operations, they crack to cyanides.

5. The concentration of water-soluble components appears to be critical. In numerous instances the streams are contacted

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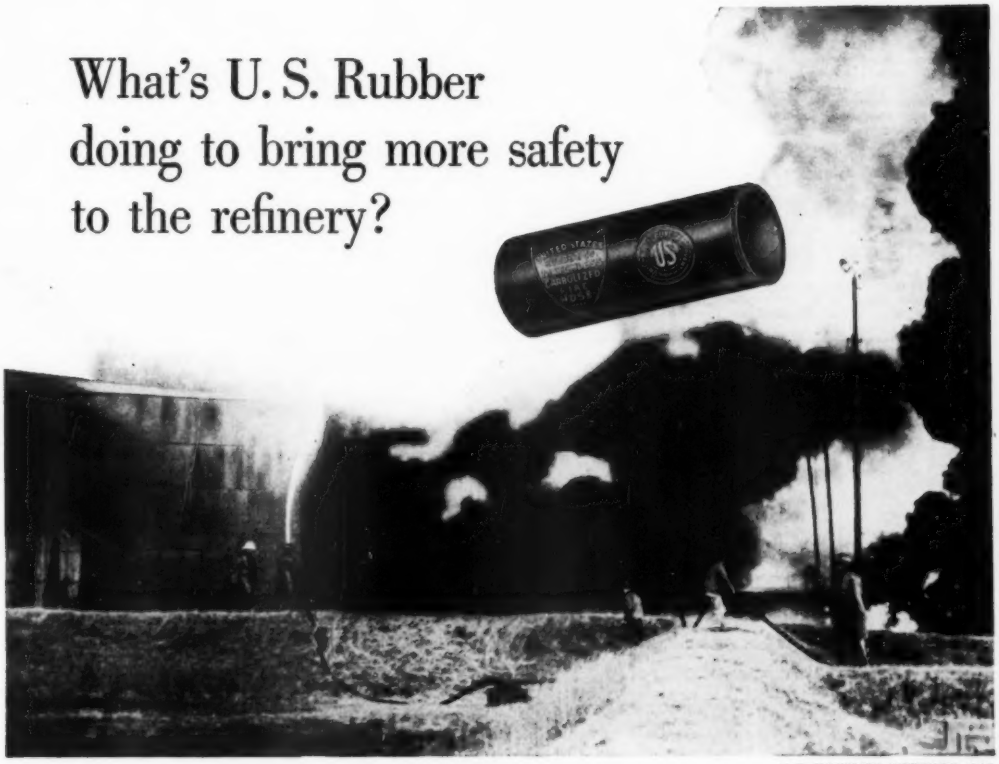

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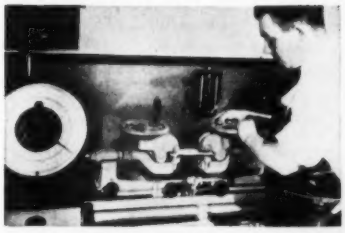

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with minor quantities of water in order to reduce the formation of plugging deposits. Following these light water-washing operations, hydrogen damage appears to increase. It is thus suspected that a critical balance of water-soluble components may exist under which the attack is negligible, and that this balance may be upset by removing only part of the water-soluble components.

6. An extensive water wash has the effect of removing the promoting agent or of reducing it to a safe level. Streams which had been contacted thoroughly with large quantities of water lose their ability to promote hydrogen attack.

7. It is known that active promoters are selectively extracted into the water phase. In one plant in which extensive water washing is practiced and in which no blistering is found in the gas plant itself, the water drainings from the unit are stripped of obnoxious gases in an atmospheric tower before the water is rejected to the sewer. The column, condenser, and overhead accumulator for this stripping operation blistered severely. This particular instance warranted special study, because the blistering occurred in the presence of large quantities of ammonia and under conditions of high pH. The attack was particularly virulent. Steel pads which were welded to the outside of the condensate accumulator, and which were fitted with a pressure gage, showed a hydrogen-pressure buildup in excess of 200 psi. in less than 4 days.

8. The active environment follows the light hydrocarbons throughout the process plants. The attack is severe in unstabilized gasoline streams but, after stabilization, occurs only in equipment which handles the butane, propane, and ethane fractions. No damage appears in subsequent equipment which processes or stores the stabilized gasoline.

9. In catalytic cracking plants the active components are produced in plants which use either natural or synthetic catalyst. Minor variations in the methods of catalyst regeneration have no marked influence upon the activity of hydrogen penetration in the gas plants which process the products of catalytic cracking.

10. In general, the corrosion rates at locations where hydrogen damage occurred are of a moderate to low order of magnitude. Many are in the order of 0.001 to 0.010 in. per year. However, in isolated cases, as in the sour-water stripping column mentioned previously, severe hydrogen damage is associated with high corrosion rates.

11. The pattern of hydrogen damage in any one plant is erratic. In some locations blistering occurs only in certain condensers in banks of several parallel stacks. In others there is no evidence of blisters in condensers, but the accumulators are severely attacked. Furthermore, the pattern of attack in any one vessel is erratic. Examination of adjacent plates in the same vessel frequently shows one to be blistered severely with no evidence of blistering on the other. In general, the heads of pressure vessels are less severely attacked than the shells. More careful examination of some of this equipment has shown that, even though no blisters are found, the plates are badly fissured.

12. The pattern of attack inside a pressure vessel often appears to be associated with the phases in contact with the steel. In general, although there are exceptions, blistering is more severe in the vapor space of accumulators than in the aqueous layer which accumulates in the bottom of the vessel. In spherical vessels and in horizontal cylindrical accumulators, maximum damage often occurs in a band oriented 30° to 45° from the vertical, and in the bottom half of the vessel.

13. Tempered-alloy and high-carbon steels are more subject to embrittlement than are low-carbon mild steels. Tempered-alloy bolts, springs, and compressor valves are particularly susceptible to embrittlement when they are exposed to corrosive conditions which promote hydrogen penetration. In several instances where bolt failures have become intolerable, replacement of tempered-alloy bolts with mild steel bolts has been advantageous.

14. The austenitic grades of stainless steels are satisfactorily resistant to the corrosive environments which promote hydrogen penetration in carbon and low-alloy steels. The ferritic grades of stainless steels are not suitable, as these steels become severely embrittled when they are exposed to environments conducive to hydrogen penetration.

15. Protective linings have been tried, but no really satisfactory enamel type of lining adaptable to field application has been found. Cement and concrete linings inside accumulators and tanks are used with success, but application is limited.

Inspection of equipment reveals that hydrogen attack is much more prevalent than has been suspected heretofore. The authors strongly recommend that inspection departments search carefully for signs of hydrogen damage. Although most cases of hydrogen attack which have been reported refer to blisters of steel plate, it is now known that, even where there is no evidence of blisters, many plates are fissured. It is most likely that meticulous inspection of vessels will reveal hydrogen attack not suspected previously.

Instruments and Testing Methods

Several means of investigating the environments which cause hydrogen attack may be followed. Among these are: (1) chemical analyses of the process streams from samples taken at a time when it is known that hydro-

NUMBER SIX

PIPES

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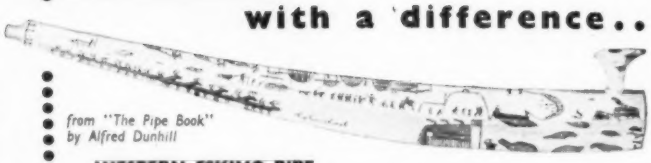

from "The Pipe Book" by Alfred Dunhill

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This reproduction of a smoking pipe of walrus ivory is a fine example of Eskimo art. The scratched drawings are beautifully executed and show a house with chimney, a flag-staff, a herd of tame reindeer, and a large fishing net in use behind the igloo. The boring of the stem has been effected by cutting out a series of oblong panels, subsequently fitted back into place; the pipe can be cleaned by removal of a panel.

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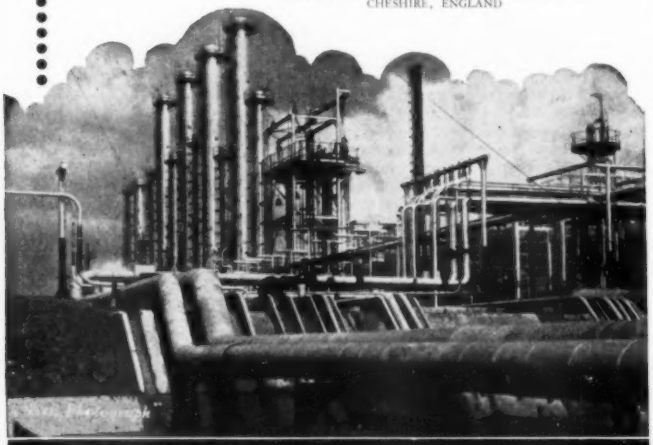

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NEWS

May ★ One of a Series of Interest to the Petroleum Industry ★ 1951

Petroleum Laboratory Finds Copper Present in Commercial Gasoline Samples

Du Pont's Petroleum Laboratory at Deepwater, N. J. recently checked thirty-three samples of commercial gasoline for copper content and found the element present in seventeen of the samples. The table below shows the geographical distribution of these samples together with a range of copper content observed:

	No. of Samples	*No. with Copper*	*Range of Copper Content in p.p.m.*
Phila.	7	2	.06 to .12
Tulsa	5	2	.06 to .12
Chicago	8	3	.05 to .21
Los Angeles	6	4	.05 to .13
Houston	7	6	.02 to .09

The analyses were conducted by the colorimetric method which will detect copper whether it is deactivated or not. As a result, the data do not indicate how many of the contaminated samples contained deactivator.

Automotive Technologist Specializes in Analysis of Engine Operational Problems

IVER T. ROSENLUND, who came with Du Pont in 1947, is the company's automotive engine specialist for the analysis of operational problems encountered in automotive equipment including farm tractors and heavy-duty trucking units. He was formerly Manager of the Du Pont Road Test Laboratory which operates a fleet of test trucks out of El Monte, California. Mr. Rosenlund is available to automotive equipment manufacturers, fleet operators and others who wish to make use of his extensive experience.

Mr. Rosenlund graduated from the University of Michigan in 1937, with a Bachelor of Science degree in aeronautical engineering, majoring in engine design. He spent the first few years of his career in aircraft engine testing and the development of automatic machine tools for the manufacture of aircraft engine parts. He has been actively engaged in problems of combustion and lubrication of engines since 1939 when he became a research engineer on engine testing for the development of petroleum products for the Texas Company in its research laboratory at Beacon, New York.

Between 1942 and 1947, Mr. Rosenlund was fuel and lubrication engineer for Allison Division of General Motors and later joined the Packard Motor Car Company in the jet-engine division at Toledo, Ohio, as project engineer on combustion chamber design and development.

Du Pont Truck Fleet Develops Valuable Heavy-Duty Road Test Data

What would you think of a fleet owner who gave his drivers instructions to take a load of gravel on a 208 mile jaunt and to return without delivering the cargo? Yet this is what happens regularly to each of six identical semi-trailer combinations operating out of the Du Pont road test laboratory at El Monte, California.

Shown are two of the fleet of six trucks used by Du Pont to make commercial, heavy-duty road octane tests. Each truck grosses 26,000 pounds on every trip. The terrain at this point appears rugged.

In evaluating the performance of experimental antiknock fluids prior to release for consumer use, laboratory testing is not enough. That is why Du Pont operates a six vehicle, heavy-duty, commercial test fleet under severe overload conditions on the hill and desert highways around Los Angeles.

A typical test might cover as much as 35,000 miles. As would be expected, much information is developed. Included would be information on octane requirements; valve life; cylinder bore wear and piston ring wear; fuel and oil consumption; and data on sludge and varnish deposits.

Here are some of the interesting characteristics of the fleet which travels without destination, delivers no load, yet brings back highly significant information.

The six tractor-trailer combinations are identical in every way, including their 235 cubic inch valve-in-head engines. The body of each trailer is partitioned to prevent shifting of the gravel which is used to weight the vehicles. This precaution is necessary to maintain a constant load on the tires which often are experimental tires being service-tested by the Rubber Chemicals Division of Du Pont.

The six vehicles always travel in convoy. They gross 26,000 pounds each. This weight corresponds to a sixty per cent overload for the tractor rating. With this loading, full throttle operation is required over most of the

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

Refinery Calls in Du Pont Automotive Specialist to Solve Annoying Problem

Fleet Customer Blamed Trouble on Refiner's Fuel

An Eastern District customer of Du Pont had complaints of engine sludging and heavy deposits on intake ports and valves from a fairly large fleet using its products. As is often the case, the refiner's products were blamed.

The refiner asked one of Du Pont's automotive specialists to investigate. He contacted the fleet owner, accompanied by refinery representatives. Several days were consumed in discussing the problems and in examining the fleet units and their operational patterns.

Both passenger cars and trucks were involved. Daily mileages were low, ranging from 40 to 100 miles. There was little prolonged heavy-duty work. Much of the operation was under conditions where engines were never completely warmed up in the course of a day.

Lengthy round-table discussions ended in the conclusion that most of the vehicles were subjected to unfavorable operating conditions such as prolonged idling and low output operation, with short hauls, frequent shutdown, and subnormal operating temperatures. These operating conditions, plus too infrequent oil change periods, were considered to be sufficient to cause the crank case sludging and intake valve troubles reported. Remedial recommendations were made and carried out to a satisfactory solution of the problem.

From the above it will be seen that Du Pont can contribute both knowledge and experience to the solution of a problem in the field. In such matters Du Pont will cooperate wherever it is feasible to do so.

Du Pont Offers *New Blending Calculator*

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A slide calculator for easy determination of the number of pounds of Du Pont Tetraethyl Lead Compound – Aviation Mix required for a given quantity of gasoline, is available through Du Pont Petroleum Chemicals Division District Offices.

The calculator is designed as a time-saver for blenders, chemists or others engaged in blending tetraethyl lead compound with gasoline.

Convenient in size, 9" x 4½", the calculator easily fits into a desk drawer or a coat pocket. With it, one can calculate the pounds of TEL Compound required to treat a given number of barrels of gasoline to produce concentrations from 0.1 to 4.6 cc. of TEL per gallon.

The calculator is quickly set in one operation.

This extremely handy Du Pont TEL Compound (Aviation Mix) Blending Calculator can be supplied by the nearest Du Pont Petroleum Chemicals Division District Office.

LITERATURE AVAILABLE

The following is a partial listing of free Du Pont bulletins, reports, booklets and aids available to you. Address requests to your nearest Du Pont Petroleum Chemicals Division District Office.

Du Pont Services to the Petroleum Industry . . . . . Serial A-663

Exhaust Valve Rotation—covers the use of mechanical devices to improve valve life . . . . . Serial A-656a Pet.

Du Pont Gasoline Antioxidants Nos. 5, 6 and 22—describing their use and application for improving gasoline storage stability . . . . Serial A-513

The Effect of Hydrocarbon Structure on the Road Antiknock Performance of Motor Fuels . . . . Serial A-505

Tank Talk—a 52-page pocket-sized booklet written for the men who actually enter and clean gasoline storage tanks . . . . Serial A-1134

CONTINUED *Truck Fleet*

test route. The trucks are operated for sixteen hours per day.

The drivers and positions of the trucks are rotated daily to overcome variations which might be caused by differences in driver techniques. Drivers try to treat all trucks alike even in such minor details as braking, shifting and accelerating.

The route presents a normal intercity truck route winding through the foothills and mountains near Los Angeles. There are steady upgrades at full throttle, rolling downgrades requiring closed throttle positions and considerable stop-and-go driving in cities. The 208 mile course requires an eight hour shift per circuit.

Engines are operated at three-quarter to full throttle approximately seventy percent of the time. Average speed is thirty-seven miles per hour—maximum is fifty-five.

Since findings from the operation of this fleet are too detailed to be presented here, the principal purpose of this résumé is to suggest that there is considerable value in fleet work of the type outlined as a reproducible method for investigating differences resulting from fuel variables.

It is believed that experimental compounds which show promise in convoy operated tests can be released for further proof testing in commercial operations with considerable assurance of satisfactory performance. The tests also show that uniformly good performance can be obtained by paying close attention to maintenance techniques.

For more complete data on the findings address your nearest Du Pont Petroleum Chemicals District Office.

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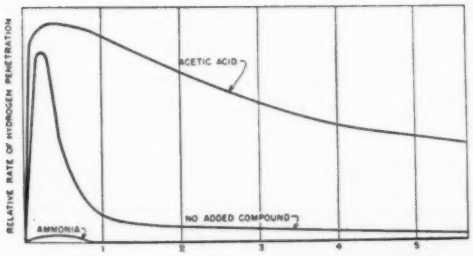

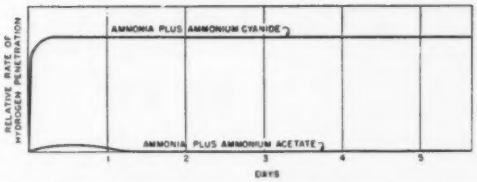

Figs. 4 (left) and 5 (right)—Rate of hydrogen penetration vs. time.

gen is penetrating into the steel vessels; (2) use of the plant itself as an experiment unit in which processing conditions can be varied and the effect of such variations in producing hydrogen penetration determined; and (3) synthesizing of processing streams in the laboratory in which one component can be studied at a time and by determining the effect of such changes in the rate of hydrogen penetration of steel.

All these approaches have one factor in common, viz.: it is necessary to have an instrument to determine the effect of the environment on penetration of hydrogen through the steel.

Hydrogen probes.—Early in this program it was recognized that there was need for an instrument for measuring the activity of environments which promote hydrogen penetration. Previously the rate of hydrogen penetration had been measured by observing the pressure buildup under reinforcing pads or inside steel thermowells. However, these methods had required periods as long as several months before pressure increases were significant, and they had not been sensitive to daily changes in the environment. Therefore, work was concentrated upon developing techniques suitable for the evaluation of daily changes in the activity of the plant environments.

It was first thought that measurements of physical properties, such as magnetic permeability, conductivity, or ductility in steel, might provide a means for the evaluation of the hydrogen content.[25] Preliminary tests indicated that, although these properties varied with hydrogen content, the methods lacked sensitivity and reproducibility.

Further work was focused upon developing a membrane type of hydrogen-accumulating device with the required sensitivity. Several varieties of probes were developed. The instrument selected for standardization purposes combines the features of adequate sensitivity, ruggedness, simplicity, small size, and economical construction.

Sensitivity is acquired by the use of a thin-walled small-volume probe which permits rapid hydrogen penetration and a measurable pressure change with only a small accumulation of hydrogen. The probe is fitted with a pressure-indicating gage. However, the same probe is adaptable to continuous record. In some locations it has been found advantageous to modify the probe so as to permit inserting and withdrawing the instrument through a stuffing box while the vessel is under pressure.

Prior to use these probes are tested

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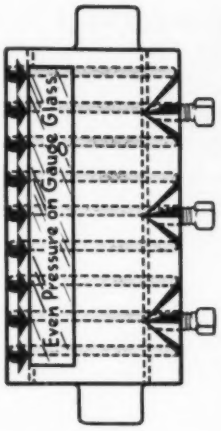
for leaks either by pressure testing with hydrogen at 100 psi., or by evacuating to about 0.1 mm. and observing any loss in pressure or vacuum after 24 hours. It is important that the probes be free of leaks because the rate of accumulation may be only a few milliliters of hydrogen per day. The volume inside the assembled probe is determined by applying two atmospheres of pressure and measuring the volume of gas released when the pressure is reduced to one atmosphere.

Knowing the volume of the probe and the area and thickness of the thin wall, it is possible to express the activity of an environment in empirical units, and thus to compare probes which have slightly different dimensions. Experience with this instrument has indicated that a period of several days may be required for the probe to become stable. Thereafter the rate of pressure rise is closely related to changes in operating conditions.

Probes of this design have been extremely useful for the detection of environments which promote hydrogen penetration, and for the evaluation of the changes in operating conditions which influence the rate of hydrogen attack. In several cases probes had actually detected active hydrogen conditions before severe blistering or fissuring was evident. In one refinery the equipment associated with the gas plant was inspected, and no blisters were found. Probes were installed at susceptible locations throughout the plant, and appreciable rates of hydrogen penetration were observed in one condenser. The unit was taken out of service; and, after sandblasting, minute blisters were observed on the steel. Operating conditions were then altered to prevent further damage.

In these investigations it was found that more sensitive probes could be constructed by making the area larger, by using cold-rolled in place of hot-rolled steel tubing, and by utilizing sensitive pressure-detecting devices. One such probe consisted of a thin-walled steel tube sealed to a Pirani vacuum gage. This probe was so sensitive that immersion for even a brief period in distilled water showed an indication of hydrogen penetration. Some of these more sensitive probes have particular application in laboratory work.

Determination of pH.—The pH of aqueous phases in contact with the steel is an important factor in the evaluation of the environment, but accurate determinations of pH inside vessels which operate at a pressure of several hundred pounds per square inch are difficult. Ordinary glass electrodes are incapable of withstanding these pressures, and colorimetric methods are inaccurate when the water is discolored. The pH of water drainings has been approximated by withdrawing a sample, under pres-



NO, this isn't the "Thing"

We wouldn't blame anybody for mistaking this goofy looking contraption for the "Thing", but that's not what it is.

It's a drawing we had made to try to illustrate why the glasses in INFERNO REFLEX GAUGES (like the one at bottom right) are so hard to break just by tightening the clamp screws unevenly.

It's a pretty hard thing to bring out in a drawing, and if you just look at it once it won't do any good. But if you'll give it just a couple of minutes of good hard staring you'll see how the design of the clamps distributes the pressure evenly all over the sides of the glass. The metal in the clamps opposite the sides of the glass is in tension. There are no places on the glass where localized compression can occur.

Then, too, the glass itself is one solid inch thick. Most gauge glasses are only ⅝ of an inch thick. You will very seldom see an INFERNO gauge glass broken by uneven tightening of the bolts.

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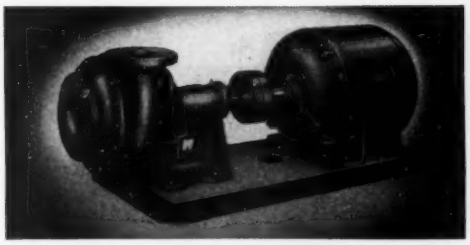

Fig. 3169 single stage, open impeller centrifugal

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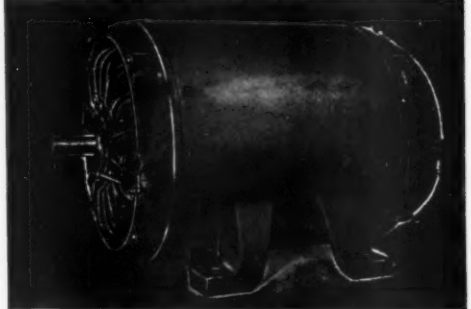

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ELECTRIC MOTORS

sure, into a clean gage glass in which indicators had been placed. Such measurements show that, in most cases, the water drainings from the bottom of accumulators are neutral to slightly alkaline.

Inasmuch as blistering has been observed to be more intense on the upper side walls of pressure vessels exposed to hydrocarbon liquid and vapor phases, it would be informative to have the true pH of the water droplets which condense upon the steel in these locations. Several attempts have been made to obtain this information, but without success. Analyses of the gas in some instances have shown negligible quantities of ammonia and appreciable acidic components such as hydrogen sulfide, carbon dioxide, and low-molecular-weight organic acids. It would seem that, although the water drainings may be neutral to slightly alkaline, the water droplets which condense in the vapor phase may be acidic in reaction.

Analysis of process streams.—The sampling and analysis of process streams are fraught with difficulties which may not be readily apparent. In withdrawing samples of either hydrocarbon or aqueous phase from pressure equipment, elaborate systems are required to avoid the loss of volatile components. The determination of the true composition of the phases which exist inside a steel pressure vessel is further complicated by the fact that some of the compounds undergo transformation when the pressure is reduced, or between the time of sampling and analysis.

Analyses for cyanide and cyanide complexes are particularly difficult because cyanides form esters, they hydrolize, or they react with other components so readily that a true evaluation of the cyanide, cyanogen, or cyanide complexes which are in contact with the steel is virtually impossible. Improvement of the techniques of sampling and analysis of these streams is a problem which requires solution.

Laboratory Investigations

The environments in plants where blistering, fissuring, and embrittlement are encountered are so complex and variable that intensive plant studies of the chemical and physical factors which influence the rate of penetration are not feasible. These factors are being investigated in the laboratory. Particular emphasis has been placed upon the influence of minor components in the environments where hydrogen damage occurs. It is believed that an understanding of the role played by these minor components may explain why severe hydrogen penetration occurs in some hydrogen sulfide environments and does not occur in others.

In the majority of the laboratory experiments, the corrosive media have been prepared synthetically from pure chemicals. In early experiments the loss in ductility of steel torsion test bars was used as a measure of the activity of the environment. Subsequently hydrogen-collecting devices similar to those used in plant tests, but designed for increased sensitivity.

(Continued on page 130)

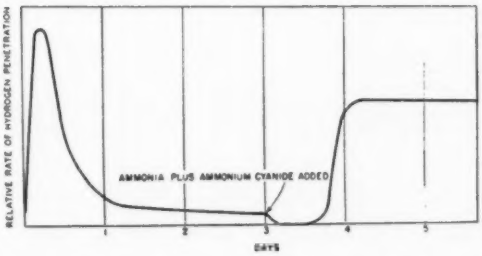

Fig. 6—Rate of hydrogen penetration vs. time.

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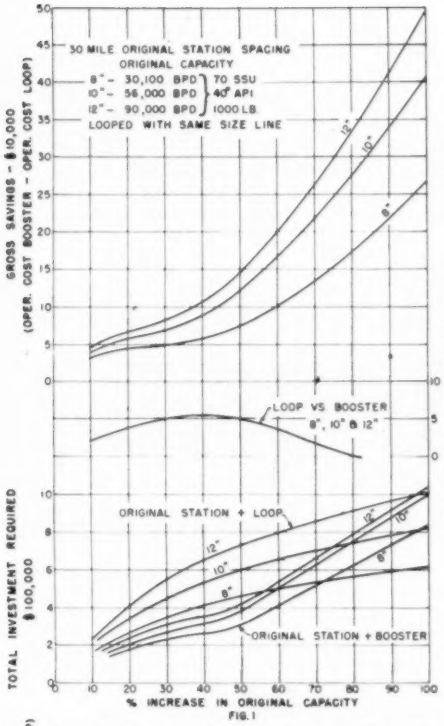
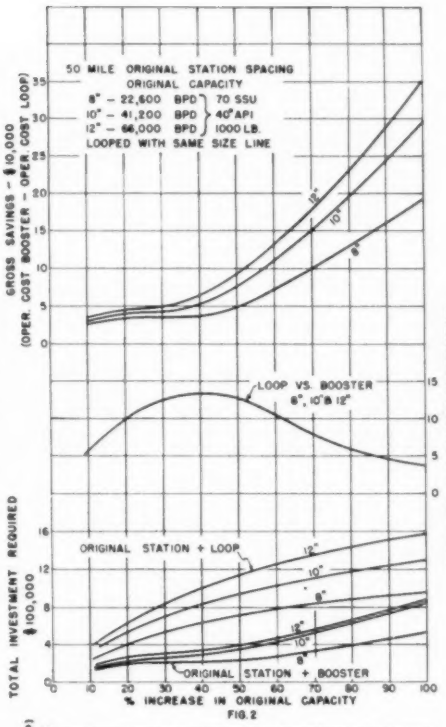
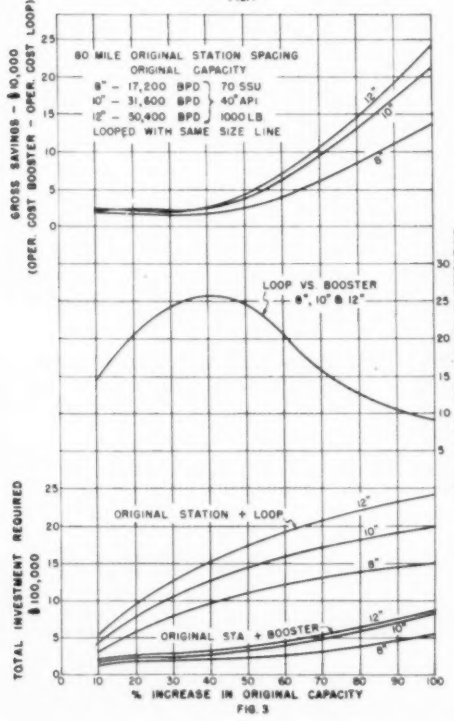
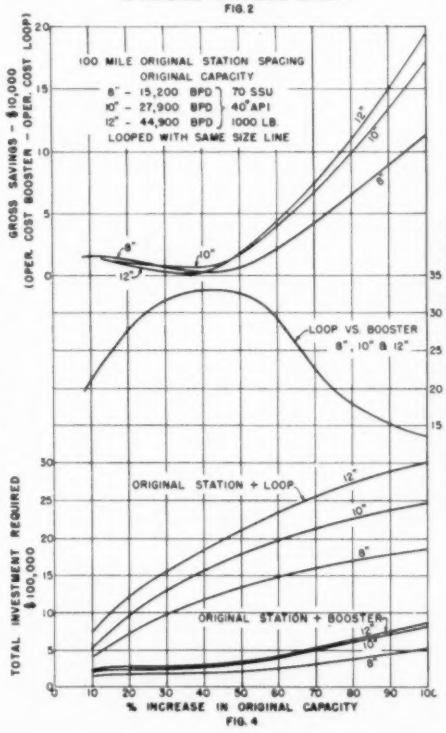

50 MILE ORIGINAL STATION SPACING
ORIGINAL CAPACITY
8" – 30,100 BPD } 70 SSU
10" – 56,000 BPD } 40° API
12" – 90,000 BPD } 1000 LB.
LOOPED WITH SAME SIZE LINE
GROSS SAVINGS – $10,000
(OPER. COST BOOSTER – OPER. COST LOOP)
LOOP VS. BOOSTER
8", 10" & 12"
ORIGINAL STATION + LOOP
ORIGINAL STATION + BOOSTER
TOTAL INVESTMENT REQUIRED
$100,000
YEARS FOR NET SAVINGS IN OPERATING
COST TO PAYOUT DIFFERENCE IN INVESTMENT
% INCREASE IN ORIGINAL CAPACITY
FIG. 1


50 MILE ORIGINAL STATION SPACING
ORIGINAL CAPACITY
8" – 22,600 BPD } 70 SSU
10" – 41,200 BPD } 40° API
12" – 66,000 BPD } 1000 LB.
LOOPED WITH SAME SIZE LINE
GROSS SAVINGS – $10,000
(OPER. COST BOOSTER – OPER. COST LOOP)
LOOP VS. BOOSTER
8", 10" & 12"
ORIGINAL STATION + LOOP
ORIGINAL STATION + BOOSTER
TOTAL INVESTMENT REQUIRED
$100,000
YEARS FOR NET SAVINGS IN OPERATING
COST TO PAYOUT DIFFERENCE IN INVESTMENT
% INCREASE IN ORIGINAL CAPACITY
FIG. 2


80 MILE ORIGINAL STATION SPACING
ORIGINAL CAPACITY
8" – 17,200 BPD } 70 SSU
10" – 31,600 BPD } 40° API
12" – 50,400 BPD } 1000 LB.
LOOPED WITH SAME SIZE LINE
GROSS SAVINGS – $10,000
(OPER. COST BOOSTER – OPER. COST LOOP)
LOOP VS. BOOSTER
8", 10" & 12"
ORIGINAL STATION + LOOP
ORIGINAL STA + BOOSTER
TOTAL INVESTMENT REQUIRED
$100,000
YEARS FOR NET SAVINGS IN OPERATING
COST TO PAYOUT DIFFERENCE IN INVESTMENT
% INCREASE IN ORIGINAL CAPACITY
FIG. 3


100 MILE ORIGINAL STATION SPACING
ORIGINAL CAPACITY
8" – 15,200 BPD } 70 SSU
10" – 27,900 BPD } 40° API
12" – 44,900 BPD } 1000 LB.
LOOPED WITH SAME SIZE LINE
GROSS SAVINGS – $10,000
(OPER. COST BOOSTER – OPER. COST LOOP)
LOOP VS. BOOSTER
8", 10" & 12"
ORIGINAL STATION + LOOP
ORIGINAL STATION + BOOSTER
TOTAL INVESTMENT REQUIRED
$100,000
YEARS FOR NET SAVINGS IN OPERATING
COST TO PAYOUT DIFFERENCE IN INVESTMENT
% INCREASE IN ORIGINAL CAPACITY
FIG. 4

Economics of

Increasing Capacity of Pipe-Line Systems

Graphic comparisons show the relationship between the payouts to be expected for capacity increases achieved by addition of loops and booster stations.

by Nicholas B. Mavris

THE original design of a pipe-line system should provide for desired eventual capacity in the most economical manner. Every effort should be made properly to forecast ultimate requirements. This history of the industry shows that most pipe-line systems were underdesigned.

When increased capacity of a system is desired after being built too small, the problem resolves itself into a selection of the most economical method of providing this increase. These methods are: (1) By a parallel line or "loop", (2) by an intermediate or "booster" station or stations, or (3) by replacing the original line with a larger-size line.

An attempt at generalizing an economic solution to this problem must be limited in some manner. The limitations used in this article are practical and should not narrow the scope of the solution too greatly. The question of replacement was not thoroughly investigated since it could not be justified within the range of the problem as established.

Comparative Study

Curves have been plotted for a comparison of looping vs. booster stations from a standpoint of savings in operating costs against additional investment required. The original systems on which this comparison is made were single lines and consequently the curves are not valid for multiline original systems. These curves are plotted for systems ranging from 30 to 100 miles in length for various capacity increases based on the original capacity of the line.

The systems studied were of 8, 10, and 12-in. pipe diameters because it was felt these were the most common sizes which are dealt with in this manner. Equal-diameter loops were used because the most economical size of a single-length loop is one in which a minimum difference exists in the diameters of the original line and the loop line.*

Payouts have also been plotted for the separate systems along with the investments required. The tariffs chosen are representative of Oklahoma and Louisiana for the size lines and length of haul used in the study.

*"The Design of Oil Trunk Pipe Lines," Oscar Wolfe. The Oil and Gas Journal, August 29, 1929.

In general, for a station spacing above 50 miles, a booster station is to be favored if it is believed the throughput will not increase more than 50 per cent. The booster station has its shortest payout at an increase of approximately 45 per cent of the initial throughput, while the payout on the loop continued to decrease up to the 100 per cent point.

Analysis

A single-line system consisting of an initial station and a line was established for the three sizes investigated (8, 10, and 12-in.) with the assumption that the receiving station would be included in the succeeding unit system and the next system would be investigated separately on the same basis. The systems were set at station spacings of 30, 50, 80, and 100 miles.

Using a pressure of 1,000 psi. on all lines, a capacity for each case was established. The increase in capacity was based on a percentage of this original "full" capacity. The percentages used were 25, 50, 75, and 100 per cent with a partial investigation of 10 per cent to definitely establish the trend of the curves.

Factors Used in Study

The three methods of solution are subject to some variations in a practical solution. That is, second-hand pipe could be used for loops or replacement, or a booster station could be a single portable unit on skids tied into the line. It was necessary, therefore, that the compromise not unduly affect the results in favor of one method over another. It is believed that the following assumptions are the ones which would influence the solution the greatest and are therefore the only ones listed.

1. New pipe was used in all cases.
2. Diesel-centrifugal operation was assumed at both the original station and the intermediate station.
3. The booster station was a permanent-type structure with a metal-clad building.
4. One spare unit was used for both one-unit and two-unit intermediate stations.
5. The stations were manually operated three shifts with as small a complements as feasible.
6. All capacity increases up to 100 per cent only were considered.

All other assumptions or estimating figures used were taken from those established by common usage by Interstate Oil Pipe Line Co.'s engineering department.

Considerations

Costs.—This phase of the problem was undertaken first from an operating standpoint. Using this method only the increase in operating cost and investment necessary for the increased throughput need be considered. By maintaining a pressure of 1,000 psi. at the initial station for both the loop and the booster, the operating cost and additional investment required at the original station will be the same in either case.

Savings.—After figuring the additional operating cost and investment in each case, the number of years for the net savings in operating cost of the loop over the boosters to pay out the difference in investment of the loop over the boosters was established. These points were then plotted versus the per cent increase in original capacity.

Payout.—It was found that the points were generally grouped together for all sizes under each station spacing. It was also found that a 10 per cent variation in the operating costs of one size would change the points enough to bring it in line with one of the other points. Thus it was

THE AUTHOR

Nicholas B. Mavris, engineer with Interstate Oil Pipe Line Co., is a native of Tulsa. After serving in the Armed Forces for 3 years he returned to Oklahoma A. & M. College where he received his B.S. in mechanical engineering in 1948. He taught in the civil-engineering department in 1948-49 and received his M.S. in mechanical engineering in 1949. He joined Interstate Oil Pipe Line Co. in June 1949 and was on loan to Interprovincial Pipe Line Co. at Edmonton, Alta., for 6 months in 1950.

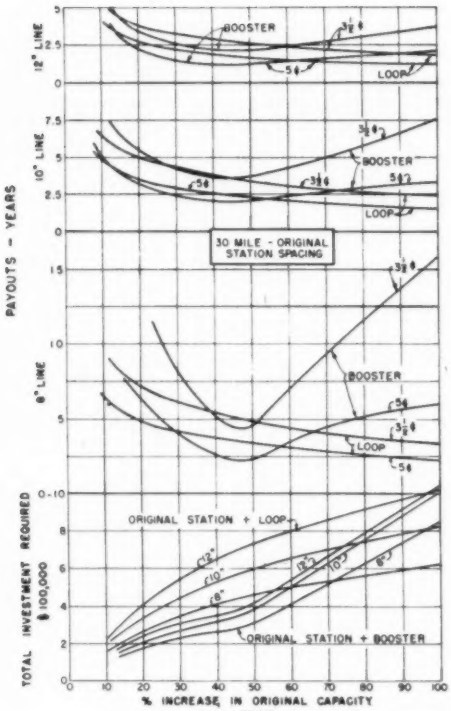


FIG. 5

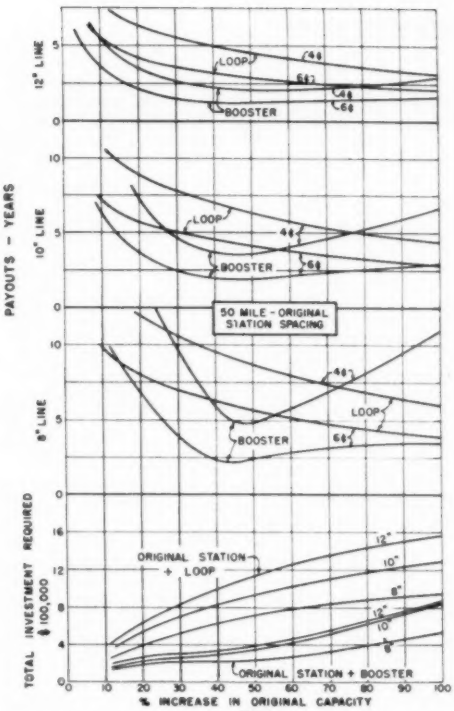


FIG. 6

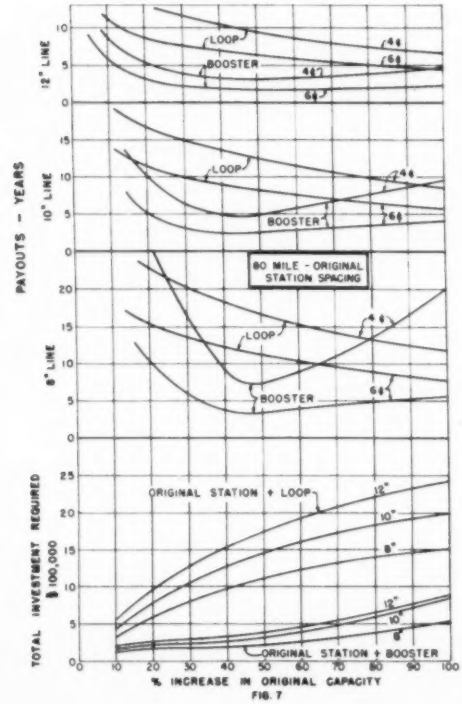


FIG. 7

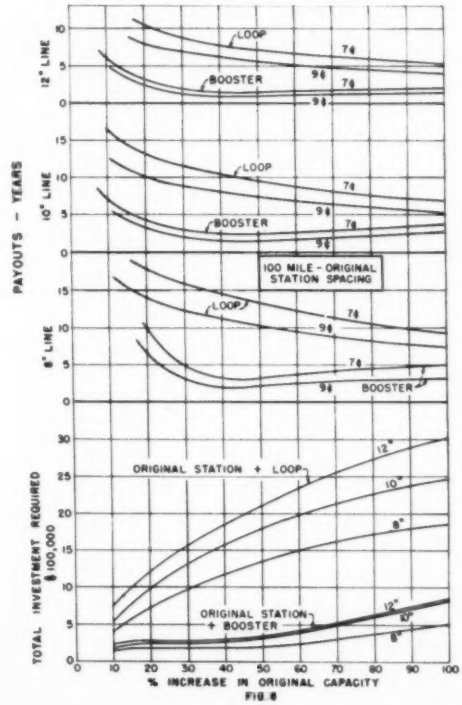


FIG. 8

felt that an average or mean line would serve the purpose and establish the trend or characteristic of the payout of the difference in investment. This curve is Fig. 9 and will be disussed under "Results and Conclusions."

The next group of curves plotted were Figs. 1, 2, 3, and 4 which show the total additional investment required at both the original station and the loop or booster station. These figures also show the payout curves of loop over booster and the gross savings in dollars of the loop over the booster station. These are all plotted against the per cent increase in original capacity.

Revenue.—A suitable range of tariffs for the sizes of lines used was established for each station spacing and the payouts were figured. It is acknowledged that these tariffs are high on a rate per 100-mile basis when compared with long-haul tariffs. Many tariffs of Interstate and other companies do fit these ranges, however, and using a lower tariff would lengthen the payouts on both methods. The ranges of tariffs selected are as follows:

30 miles—3½ and 5 cents.
50 miles—4 and 6 cents.
80 miles—4 and 6 cents.
100 miles—7 and 9 cents.

Payout rate.—The payouts are plotted on Figs. 5, 6, 7, and 8 along with the additional investments required. The payout as used here is the investment required divided by the net profit before depreciation. These payout curves are necessary to determine if either method is feasible at all, then it must be decided which method is the better.

Results and Conclusions

As shown in Fig. 9, the curves of the payout of difference in investments by the net savings in operating cost all have the same general shape with a maximum point at between 40 and 45 per cent. There are two reasons which act to cause this maximum point.

If the entire throughput could be handled through a single line, it would require 2,000 psi. pressure for approximately a 49 per cent increase in original capacity. Under the assumptions of the study, this would require a complete booster operating at maximum pressure. Above 49 per cent, it would require a second booster station and the operating costs increase rapidly.

The other reason can be explained by the curve of per cent of increase in capacity versus per cent of increase in capacity versus per cent of original line looped with a single-line system and equal-diameter loop. (See Fig. 10.)

Above the 40 per cent mark, the rate of change of per cent capacity increase to the per cent of line looped increases, which means for the same added length, more increase is attained above the 40 per cent increase point than below. These two factors are also reflected in the investment required curves of Figs. 1, 2, 3, and 4. The investment curves for the loops flatten out as they near the 100 per cent mark, while the booster investment curves all have a marked increase above the 50 per cent mark. On the same charts are shown the increasing advantage of the loops as the per cent capacity increase reaches 100 per cent. They also bring out that up to the 50 per cent point the advantage of loops increases rather slowly and for the 100-mile station spacing even decreased.

The point at which a complete booster is necessary is further pointed out by the payout curves on Figs. 5, 6, 7, and 8. It shows there is a minimum point in the booster curves whereas the loop payout curves gradually decrease throughout the range.

Generally, the conclusions can be made to cover three sections. If the increase in capacity is, or is expected to be above 50 per cent, then loops are to be favored. If increase is below 50 per cent and station spacing is above 50 miles, the booster is more advantageous and is to be preferred, but loops should be used for increases above 50 per cent. Below 50 per cent and below 50-mile station spacing, the loop has an advantage from the standpoint of payout of difference but the actual savings are small.

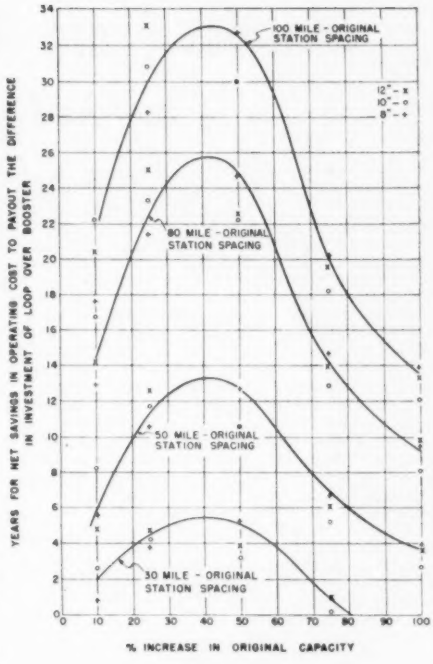

YEARS FOR NET SAVINGS IN OPERATING COST TO PAYOUT THE DIFFERENCE IN INVESTMENT OF LOOP OVER BOOSTER
100 MILE - ORIGINAL STATION SPACING
80 MILE - ORIGINAL STATION SPACING
50 MILE - ORIGINAL STATION SPACING
30 MILE - ORIGINAL STATION SPACING
12" - x
10" - o
8" - +
% INCREASE IN ORIGINAL CAPACITY

Fig. 9

It is evident that if a second increase in capacity is experienced on a system that causes the total increase to move from below 50 per cent to above 50 per cent, it would be easier to economically justify handling this second increase if the loop had been chosen initially than if the booster station had been built. The line would not only be out of balance hydraulically for the second booster station, but as mentioned before, the increase in capacity for a unit length of loop increases after the 40 per cent mark.

Replacement method.—This was investigated and was considered not valid in the scope of the study for the following reasons:

1. The ratio of miles of loop required to miles of replacement required is considerably less than the ratio of investment of replacement to investment in loop up to 100 per per cent increase. Thus, the investment for replacement is always greater than investment for looping.

2. The depreciation on the replaced system is decreased with respect to, or is less than the looped system because of the lost depreciation on the removed line.

3. The payouts of replacement over the other two methods are very high.

It is evident that for increases above 100 per cent the method of replacement assumes increasing importance. In some cases an added advantage is acquired in replacing because the pressure on an old system of 700 to 800 psi. can be raised to 1,000 psi. by replacing with new pipe.

It is again seen that judgment as to the ultimate throughput increase that can be expected for a given system and as to the expected life of throughput are the largest items in the choice between a booster and a loop.

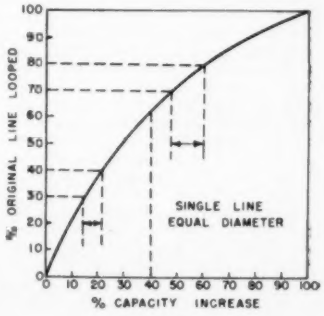


Fig. 10

Plastics From Acetylene on Increase

. . . may lead to its manufacture from natural gas

by R. S. Aries* and R. M. Cziner*

DEVELOPMENTS in production of acetylene appear to be at a turning point. While some manufacturers are sticking to the carbide process, others are looking toward natural gas as an acetylene source. A small plant for production of acetylene through natural-gas pyrolysis has been built by Tennessee Eastman-Wulff Process Co. and is now in operation at Los Angeles. Other processes for acetylene from natural gas are under investigation. Here are the factors that underlie present developments in the acetylene field.

DURING the past year, much attention has been centered repeatedly upon the American acetylene industry. The activity, both actual and speculative, of such chemical giants as Carbide and Carbon Chemicals Corp., Tennessee Eastman Corp., Allied Chemical and Dye Corp., Monsanto Chemical Co., and General Aniline Works, concerning new plants, methods of production, and new uses of this gas has aroused active interest. Last fall a threatened shortage of the gas, due to a temporary curtailment of electric power available at Niagara Falls, brought into sharp focus the importance of acetylene and the tight supply position that exists in this country. Two points need immediate clarification: (1) What is going on, and (2) how does it affect the plastics industry.

Sources of acetylene. Up to the present time, all acetylene made commercially in the United States and Canada is generated by the addition of water to calcium carbide. Since power is the largest cost component in the production of the carbide, this time-honored method is dependent to a large extent upon the availability of cheap electricity. About 3,000 kw-hr. of electricity is consumed in making 1 ton of 85 per cent calcium carbide. It thus becomes clear that under the present setup the American production of acetylene is closely controlled by the supply of power. The 1950 output of the gas, estimated at more than the 1948 peak production of 413 million pounds, severely taxed the present carbide capacity. Yet, the demand for the gas, both as a chemical raw material and as welding gas, continues to increase.

Two solutions to this problem present themselves. The first, expansion of calcium carbide output, is hampered severely by the present limits of available cheap electricity. The other solution is the introduction of one or more methods of producing acetylene directly from natural gas. This radically new approach in acetylene manufacture although successfully operated in Germany during the last war so far has not been commercially exploited in this country. Its possibilities, however, are promising.

Acetylene from natural gas. The marketable quantities of natural gas are constantly increasing, especially with the now rapidly expanding pipeline facilities. In addition, methane, the major component of natural gas, would become available in large quantities if the Fischer-Tropsch process for the production of liquid fuels from coal ever became a major factor in this country. Two basic steps are involved in the manufacture of acetylene from natural gas, first the primary production of the gas by pyrolysis and second the recovery and purification of the acetylene contained in the pyrolysis effluent.

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*R. S. Aries & Associates, New York

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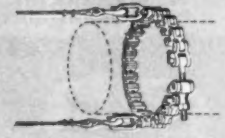

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Plastics From Acetylene on Increase

. . . may lead to its manufacture from natural gas

by R. S. Aries* and R. M. Cziner*

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DEVELOPMENTS in production of acetylene appear to be at a turning point. While some manufacturers are sticking to the carbide process, others are looking toward natural gas as an acetylene source. A small plant for production of acetylene through natural-gas pyrolysis has been built by Tennessee Eastman-Wulff Process Co. and is now in operation at Los Angeles. Other processes for acetylene from natural gas are under investigation. Here are the factors that underlie present developments in the acetylene field.

would become available in large quantities if the Fischer-Tropsch process for the production of liquid fuels from coal ever became a major factor in this country. Two basic steps are involved in the manufacture of acetylene from natural gas, first the primary production of the gas by pyrolysis and second the recovery and purification of the acetylene contained in the pyrolysis effluent.

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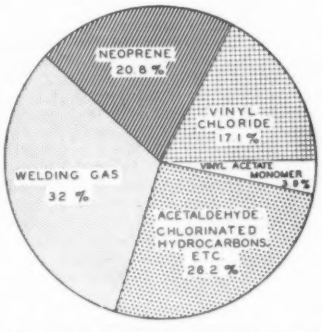

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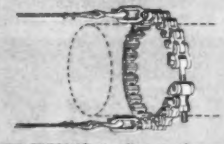

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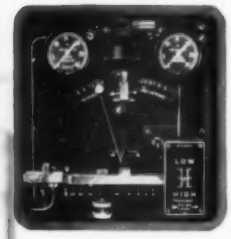
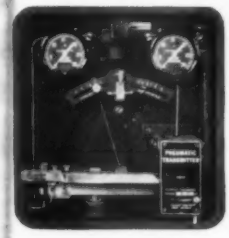
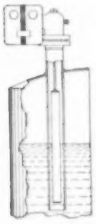


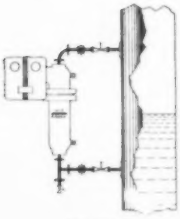
Model 12600
Proportional Control



Model 12620
Pneumatic Transmitter



Top Vessel Mounting



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Wide Variety of Controller Types
Proportional controller, proportional plus reset controller, pneumatic transmitter, two-position differential gap controller, three-position pneumatic signal switch; duplex types — proportional controller and pneumatic transmitter, proportional-reset controller and pneumatic transmitter, proportional controller and pneumatic signal switch (and other combinations as required).

Selection of Mountings
Two internal mountings—top or side vessel flanged connection; eight external mountings — displacer chamber with screwed or flanged connections arranged for best adaptability to a variety of vessels. Right or left hand instrument case mounting.

Selection of Torque Tube Materials
Selection of torque tube assembly material best suited for the application. Standard is Inconel. Monel, Type 316 Stainless Steel, or Phosphor Bronze also available. (Materials offered subject to availability during shortages.)

Available in Many Ranges
12,000 Series Level Controllers are available in many standard ranges — 14 and 32 in.; 4, 5, 6, 7, 8, 10 and 15 ft. Other ranges can be supplied for special applications.

Meet Great Variety of Applications
Typical applications include level in fractionating or crude towers, accumulators, separators, sumps, chillers, feed water heaters, settling tanks — many other applications.

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diverted from probable use by the plastics industry. One major contributing cause to this order was the fact that the critical source material for the vinyl monomer is acetylene.

The above is a very minor case, but acetylene is used extensively for plastics. R. S. Aries & Associates estimated in their survey of the acetylene industry that vinyl chloride and acetate monomer consumed about 21 per cent of all acetylene produced in 1949 in the United States. Since the ouptput of these monomers probably increased faster last year than the total production of acetylene gas, this ratio should be slightly higher for 1950. More vinyl and vinylidene chloride monomer is made from acetylene and hydrogen chloride than by the other commercial method, the cracking of ethylene dichloride. Since vinyl plastics and vinyl raw materials do not have as many wartime uses as styrene and polyethylene, the vinyls have replaced considerable amounts of these materials as they disappeared from the consumer market. The result, with both limited raw materials (one of which is acetylene) and production facilities, is that the supply of vinyl monomers has not kept pace with the demand.

At the same time the synthetic rubber industry, which is closely interrelated in many economic aspects with the supply and demand picture of the plastics industry, also functions to a large extent upon an acetylene economy. Neoprene alone used about 20 per cent of all acetylene gas in 1949.

Acrylates from acetylene.—For the future acrylates seem the most promising acetylene plastics. By means of the Reppe high-pressure synthesis work developed in Germany, acetylene, carbon monoxide, and water are used as starting materials for acrylic acid and the acrylates.

The acrylates can be polymerized to resins for adhesives, plasticizers, and viscosity-index improvers and for many other uses. The list is long.

Corrosion-Fatigue Crack Tests

(Continued from page 92)

Since the cross-section of a corrosion-fatigue crack is very nearly a semicircle with its diameter on the surface of the pipe, the depth of the crack will be approximately one-half of the measured length of the indication. In the example given in the preceding paragraph, the crack was actually two cracks which occurred in the same plane, hence the disparity between the length and depth measurements.

Field Tests

A preliminary field test was made in the Kentucky area to try out the equipment before undertaking tests in West Texas. During this trial, a joint was found which had a large number of Magnaglo indications, indicative of corrosion-fatigue cracking. However, when the piece was sectioned, there was little visible indication of pitting. This type of cracking is encountered when the drill pipe is subjected to mild corrosive conditions and abnormally high bending stresses. Comparative white-light and black-light photographs are shown in Figs. 8 and 9.

During the fall of 1950, several strings involving hundreds of pipes were inspected with Magnaglo powder in the West Texas area. In numerous cases, indications of corrosion-fatigue cracking were obtained. These pieces were sectioned to investigate the accuracy of the indications. In all cases, Magnaglo gave true indications. Two samples, which are representative of the many investigated, are shown in comparison between white-light and black-light photographs in Figs. 10, 11, and 12.

Since the indications fluoresce brilliantly under black light, they are quite easily seen, and inspection can be performed very rapidly. The process is simple, and the equipment involved is portable (as shown in Fig. 13) and is designed for field use. The next series of photographs

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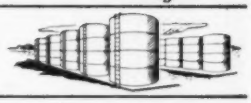
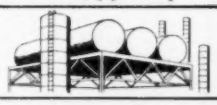


Series 200—Alkyd Basic Coatings
General purpose maintenance finishes for use under normal exposure conditions.

Series 300—Chlorinated Rubber Base Coatings
Chlorinated Rubber and Chlorinated Rubber Alkyd type for use where fumes, condensation or spillage exist.



Series 400—Vinyl Base Coatings
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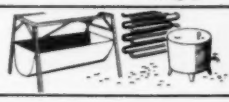
Series 500—Phenolic Base Coatings
For use where resistance to solvents, organic acids and elevated temperatures is required.



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Arthur B. Guise
Chief Engineer
Fire Extinguisher Division
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This is equally true of dry chemical fire extinguishers. Ansul *"PLUS-FIFTY"* Dry Chemical is produced under carefully controlled conditions to meet specific requirements. *This means that every container of Ansul Dry Chemical has the same uniform high quality.* Ansul Extinguishers are designed for use with Ansul Dry Chemical only and, if consistent high fire extinguishing effectiveness is to be obtained, Ansul Dry Chemical should be used for recharge purposes.

There are a number of factors influencing dry chemical quality and all must be controlled because variations in a dry chemical can affect its fire extinguishing effectiveness.

PARTICLE SIZE. The sodium bicarbonate in Ansul Dry Chemical must pass tests to insure that the size of the particles falls into a certain range. If a certain percentage of the particles are over a maximum given size, the fire extinguishing effectiveness of the dry chemical is measurably decreased. Ansul's quality control procedures insure that the fire extinguishing effectiveness is always high.

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FLOW. Ansul Extinguishers are designed to discharge dry chemical at a definite rate. Quality control during the manufacturing operation insures that Ansul *"PLUS-FIFTY"* Dry Chemical will flow at a sufficiently high rate to insure maximum fire fighting effectiveness.

MODEL 20-B

PACKING. *All* finely divided solids tend to pack. Dry chemical is no exception. Daily tests of Ansul *"PLUS-FIFTY"* Dry Chemical as it is produced insure that every batch will fluidize readily. Proper design of Ansul Extinguishers doubly insures fluidizing of dry chemical and proper, effective, discharge.

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show the sequence of operations. Fig. 14 shows the pipe being cleaned with a rotary-driven chain flail. In Fig. 15, the loose dirt and scale are being blown out. Fig. 16 shows the method of uniformly distributing the powder. In the next photograph, Fig. 17, the pipe is being magnetized and inspected with black light, while pipe is rolled to distribute the powder. Glowing fluorescent indications mark cracks. Fig. 18 shows the method of recovering the Magnaglo powder after inspection for reuse.

From the foregoing, it can be seen that the method gives positive indications of corrosion-fatigue cracks. It requires only a minimum of time for rough cleaning and inspection, with a minimum of equipment and personnel. Magnaflux Corp. is continuing field work, and is making the process commercially available.

Conservation of Lease-Tank Vapors

(Continued from page 96)

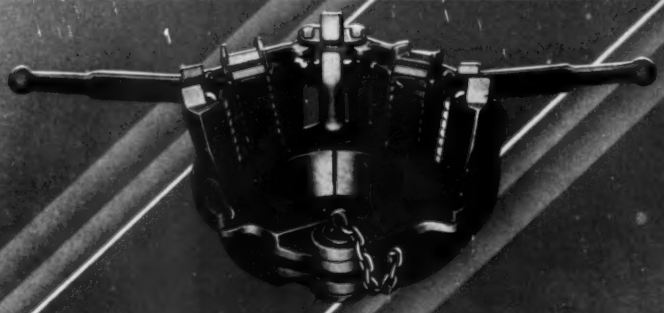
processing-charge provisions, it is readily evident that a quick payout was made. During July and August alone, as shown, the value of the products and gas recovered monthly exceeded the total cost of installation. (This project will be covered in a separate article to appear next week.)

Riverdale field.—Two installations in this field, northern San Joaquin Valley, also show a good payout record. One lease produces about 330 bbl. of crude daily, from which about 350 M.c.f. of wet gas is trapped. At the battery of four tanks which handles this production, vapor-collecting equipment costing $2,000 was installed. The volume of vapors collected and their value in the 6 months following installation are given in Table 4.

Also given in Table 4 are performance data on a six-tank system, installation costs of which totaled $2,500. There, as in the four-tank system, compression equipment was not required. Crude production handled by this battery is about 770 bbl. daily.

Oak Canyon field.—In this field near Newhall, Western Gulf Oil Co. has had a vapor-conservation project under way since April 1946. Total investment for equipping five tank batteries, including compression equipment, was $11,600. Through September 1950, after paying relatively high processing royalties, gross revenue to the operator from the liquids and gas recovered totaled $42,000. During this almost 4½-year period about $19,000 was spent for purchased electric power and fuel gas, repairs, maintenance, and labor. Thus after amortizing all facilities and deducting all operating expenses, the systems show a net profit of over $11,000.

Total crude production handled by the five batteries has averaged less than 2,000 bbl. daily during the pe-



MISSION LIGHT WEIGHT TUBING SPIDERS

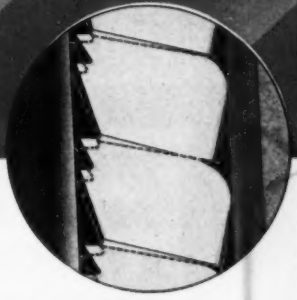


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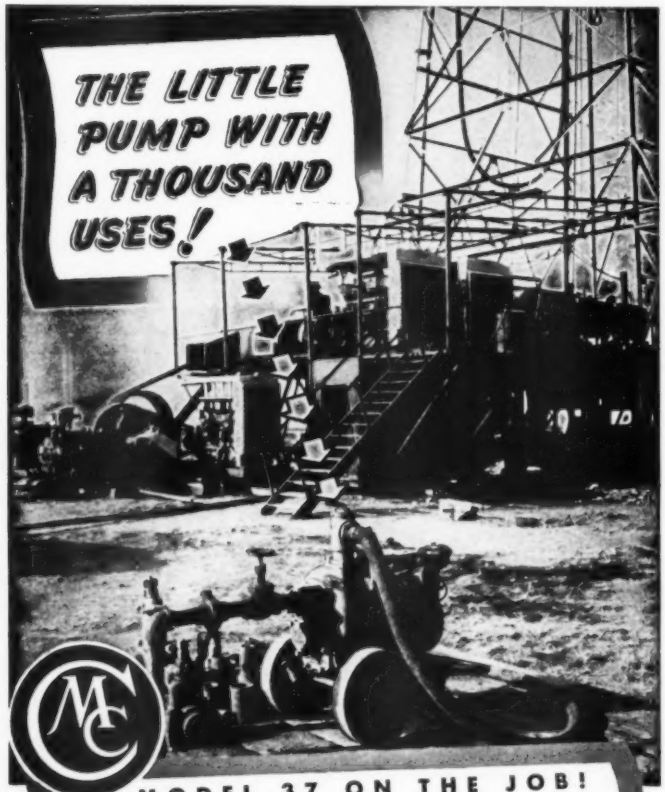
TABLE 4—PERFORMANCE OF TWO INSTALLATIONS IN RIVERDALE FIELD

	Vapors recovered (M.c.f./mo.)	Gasoline content (gal./M.c.f.)	Gaso. rec. Gal.	Gaso. rec. Value	L.P.G. content (gal./M.c.f.)	L.P.G. rec. Gal.	L.P.G. rec. Value	App. value residual gas	Total value rec. prod.
Lease A. Four-Tank System									
1950—									
April	458	4.68	1,914	$149	4.56	3,320	$256	$62	$467
May	548	4.60	2,168	168	3.56	3,200	237	74	479
June	611	5.73	3,291	257	3.20	2,913	207	82	546
July	799	7.26	5,360	918	3.59	5,334	336	108	862
August	1,122	4.66	5,077	397	4.15	8,542	503	151	1,051
September	1,428	7.24	10,070	787	0.64	1,444	79	193	1,060
Lease B. Six-Tank System									
1950—									
April	2,576	7.52	16,465	$1,251	5.05	20,684	$1,593	$348	$3,193
May	2,875	7.97	19,637	1,532	4.23	19,993	1,479	388	3,399
June	2,008	7.63	14,401	1,123	3.82	11,430	1,040	271	2,435
July	1,995	7.43	13,696	1,068	3.21	11,885	748	269	2,085
August	2,537	6.97	17,170	1,341	2.76	12,814	756	343	2,440
September	1,632	7.97	12,669	991	0.16	412	23	220	1,234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riod of the system's operation. As is shown in Table 5, total vapors recovered by the first of this year were 212,400 M.c.f., or about 25 M.c.f. per battery per day. The vapors currently average about 9.80 gal. of butane and heaviers per thousand cubic feet.

The Oak Canyon systems are of interest because they show that a payout can be achieved even though the volumes of gas available are small and a relatively high rate paid for having the gas processed. Also compression equipment is needed at each battery to boost vapors from around atmospheric to a discharge of 70 psi.

TABLE 5—VAPOR-RECOVERY OPERATIONS IN OAK CANYON FIELD

Lease	No. and size of tanks	Vapors rec. Apr. 1946 to Oct. 1950 (M.c.f.)	Estimated liquids (C, plus) recovered (gal.)
A	6— 500's	84,000	550,000
B	6—1,000's	36,500	420,000
C	4— 500's	55,700	470,000
D	6— 500's	36,300	360,000
E	2—1,000's		
	2— 500's	19,000	210,000
Total		212,400	2,010,000

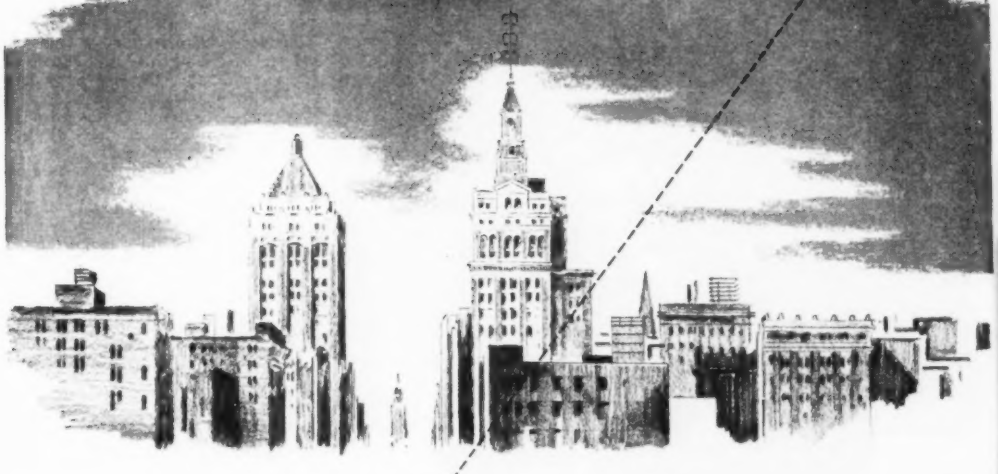
In the aforegoing examples it can be seen that the cost of vapor recovery equipment was in the range of $400 to $500 per tank. The average cost per four-tank battery was in the neighborhood of $2,000 at the time of their installation. However, because these installations were chosen more or less at random, and because of the wide range, the average cost per battery is somewhat meaningless. For example, at a recent six-tank installation at Long Beach, because of the relatively large compressor required the total cost of the system was about $8,500.

More important, they show that very rapid payouts can be obtained where substantial volumes of vapors are available. In the case of the $8,500 system mentioned above, a payout was effected in about 7 months. They also show that in some instances reasonable payouts can be had from surprisingly small volumes, even though compression equipment must be installed at each battery.

The systems discussed above are not meant to be typical in costs and payout rates; they were selected principally because of the availability of data. However, because fairly accurate cost and payout rate surveys can be made prior to the installation of vapor-recovery equipment, good payout rates are the rule. Principal exceptions are where the necessity for reducing fire hazards outweighs any economic considerations.

Likewise the maintenance and operating costs of the Oak Canyon installations are by no means an average figure. Where compression is required, using purchased electric power for motors ranging from 5 to 15 hp., one company calculates its total operating and maintenance costs to range from $35 to $85 per battery per month.

TOPS



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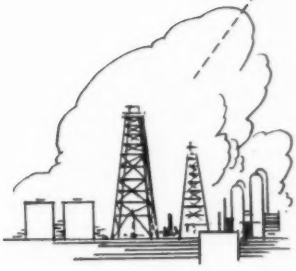

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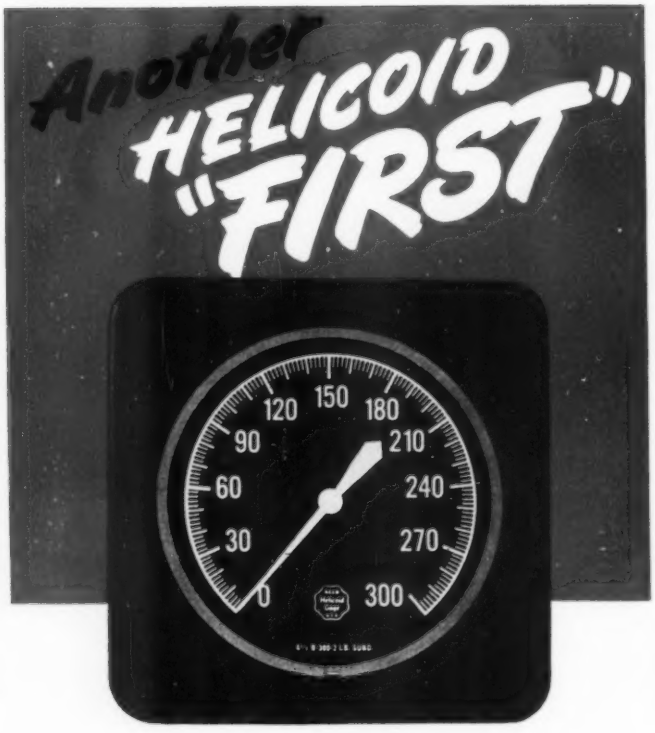

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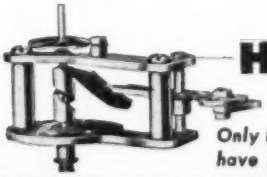

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How Hydrogen Attacks And Damages Steel

(Continued from page 117)

were found to be more suitable because they permitted a continuing study of a given environment.

Effect of pH.—Early in this investigation it was confirmed that hydrogen sulfide dissolved in water, or that a wet atmosphere which contains hydrogen sulfide, is an active environment for the promotion of hydrogen penetration. However, in tests extending over several days, it was found that the rate of hydrogen penetration decreased markedly. This decrease in activity was associated with the buildup of iron sulfide deposits on the steel surface. Reducing the pH of the hydrogen sulfide solution by the addition of acidic material, such as acetic or formic acid, increased the rate of hydrogen penetration. Increasing the pH by the addition of very small amounts of ammonia or other alkali resulted in almost complete elimination of hydrogen penetration. These effects are illustrated in Fig. 4.

This series of tests explained why some hydrogen sulfide rich environments were active in promoting hydrogen penetration and why others were inactive. However, severe hydrogen-penetration damage was being experienced in several locations where the pH was high. In fact, strong alkalies were present. It was observed in the laboratory experiments that the activity increase which had been observed when the solutions were made acidic was associated with removal of iron sulfide scale. Therefore, it was postulated that other reactions which would destroy the sulfide scale under alkaline conditions might promote hydrogen penetration. One such reaction which had been observed in the plant was the formation of iron ferrocyanide complexes. Therefore, later work was concentrated upon a more complete investigation of the influence of cyanide compounds.

Effect of cyanide complex formation.—Investigation of the influence of high concentrations of cyanide ion revealed that, although hydrogen cyanide was generally inactive in influencing the rate of hydrogen penetration, cyanide salts caused a marked effect. This is shown in Fig. 5. The activity shown is apparently caused by cyanide ion; and, inasmuch as hydrogen cyanide is only slightly ionized, this component will have little effect in acid solutions. In alkaline solutions, however, sufficient cyanide ion is present to react with the iron sulfide and to lead to continued activity. This is a mechanism by which high rates of hydrogen penetration can occur in an alkaline environment such as that of the sour water - stripper column previously mentioned.

Still another effect of cyanide ion is illustrated in Fig. 6. In this experiment, a probe was exposed to hydrogen sulfide and water for several days, and then a small amount of ammonium cyanide was added to the water. It was shown that the probe at first passed hydrogen readily. Then, as the sulfide film was developed, the rate of hydrogen penetration was reduced to a low figure. Immediately following the addition of the ammonium cyanide, the rate of penetration decreased to essentially zero, as would be expected, because the cyanide salt was alkaline in nature and raised the pH. Then, after some lapse of time, the rate of penetration increased sharply, and continued at a high level.

In these experiments the ferrous sulfide coating was observed to dissolve with the formation of a blue-gray complex iron ferrocyanide on the steel. The laboratory observations thus parallel the experiences previously mentioned in catalytic cracking gas plants where cyanides, as evidenced by the formation of iron-ferrocyanide complexes, appeared to be closely associated with the incidence of hydrogen damage.

Further tests have shown that, for water solutions which contain hydrogen sulfide, the rate of hydrogen penetration in acidic environments is primarily influenced by the hydrogen-displacement reaction between the steel and the acid—and, under strongly acidic conditions, the iron sulfide scale does not accumulate to appreciable thickness. In alkaline environments, the formation of ferrocyanide complex modifies the scale so as to permit the corrosion reaction to continue.

Avoiding Hydrogen Damage in the Plant

From the accumulated data of plant experience and laboratory tests, it appears convenient to classify hydrogen-active environments as follows:

1. Environments in which relatively pure hydrogen sulfide-waters solutions are in contact with steel.
2. Environments in which hydrogen sulfide, water, and acids are present.
3. Environments in which hydrogen sulfide, water, cyanides, and ammonia are present.

In the first classification, continuing damage from hydrogen penetration is likely to be slight unless operating conditions are sufficiently fluctuating to damage the protective iron sulfide scale formed. In these instances, addition of very small quantities of ammonia to the stream should be sufficient to increase the pH of the aqueous phase so that hydrogen penetration will not occur.

In the second classification, in which moderately strong acids such as formic, acetic, and similar acids are present, excessive quantities of ammonia may be required to raise the pH to safe levels. Furthermore, inasmuch as the solubility of ammonia in water is much greater than the solu-

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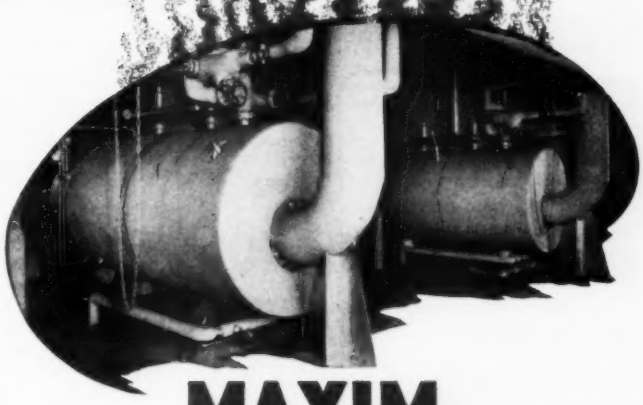

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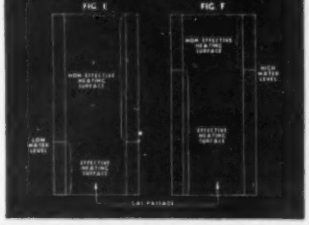

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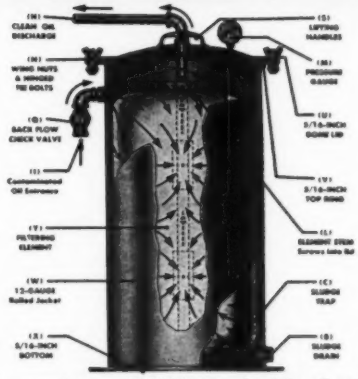

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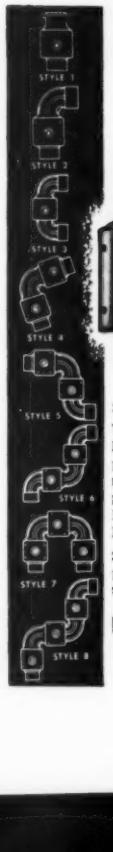

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bility of the acidic components, it will be selectively extracted when water condenses from the stream.

In an operating unit, reinjection of ammonia in several locations may be required. Obviously, the removal of water-soluble acidic components would be more practical. In a number of plants this is being accomplished by a thorough water wash of the hydrocarbon liquid and gas streams.

In the third classification, in which cyanide and ammonia are present, it is usually true that the stream also contains appreciable quantities of acidic components. In any event, mitigation will be effected if cyanide, ammonia, and acidic components are reduced to a safe level. This is being accomplished by an extensive water washing of the gas streams. The determination of the required degree of water wash can best be guided by the use of hydrogen-activity detection probes located at suitable points throughout the plant.

Plant applications.—Specific application of these corrective measures has been made at one refinery. This case will be described in detail. Hydrogen blistering was first observed in this plant in December 1948, when severe blistering was discovered in the shells of four of six condensers located following the high-pressure stage of compression. In April 1949 blisters were discovered in the rich-oil still reflux condenser. During 1950, 14 additional cases of blistering were discovered throughout the gas-compression and gas-fractionation plant associated with the catalytic cracking plants. These later cases include condenser shells, accumulators, and one absorber column. This alarming rate of increase in blistering damage demanded immediate investigation and mitigation.

An attempt was made to correlate the increased rate of blistering with operating variables, and it was found that blistering became apparent coincident with the startup of a new deep flasher. At about this same time severe difficulties were experienced with the formation of plugging deposits which consisted of iron sulfide and iron ferrocyanide.

Several years previously another catalytic cracking gas plant had experienced similar plugging difficulties, and the problem was alleviated by washing the gas streams with water. Based on these data, water washing was tried on the plant just described by utilizing temporary facilities to inject approximately 20 gal. per minute of water into the gas streams which have a capacity of 25,000,000 standard cubic feet per day. This reduced the plugging deposits, and operation of the water wash was continued in this manner for approximately 6 months.

In the meantime hydrogen-blistering damage was observed in several pieces of equipment. Therefore, two probes, sealed at each end and attached to a pressure gage through a piece of capillary steel tubing, were installed in vessels where blistering had occurred. The probes were of cold-drawn steel tubing 12 in. long, 1 in. in diameter, with a wall thickness of ⅛ in. After approximately 30 days, hydrogen pressure began to build up in these probes, and it was observed that the pressure buildup would stop when the water-washing operation was discontinued. In the light of this and the experience of other plants where meager water washing apparently promoted blistering, it was decided to discontinue water washing until further information could be accumulated regarding adequate control of the blistering difficulties.

At this time the standardized probe previously described was developed and installed in critical locations throughout the gas and compression plants. These revealed that hydrogen activity was widespread throughout the plant, and that it was progressing even after water washing had been discontinued.

In an effort to alleviate the attack by raising the pH of the gas stream, a trial was made during which ammonia at the rate of 60 lb. per hour was injected into the gas ahead of the compressors. Measurements of the

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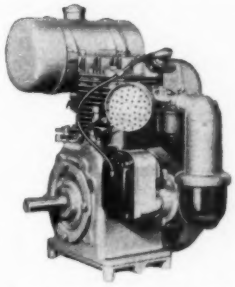

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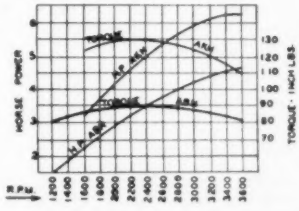

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	2600 R.P.M.	3.7	5.3
	3000 R.P.M.	4.2	5.9
	3600 R.P.M.	4.6	6.2
Main Bearings		Tapered Roller	
Piston		Aluminum Alloy	
No. of Piston Rings		4	
Connecting Rod		Aluminum Alloy Babbitt Lined	
Crankshaft		Counterbalanced Heat Treated Drop Forging	
Cylinder Head		Aluminum Removable	
Cylinder — Crankcase		Cast Iron	
Valve Seat Insert (Exhaust)		Nickel Chrome Molybdenum Iron	
Spark Plug Size		18 mm. Metric	
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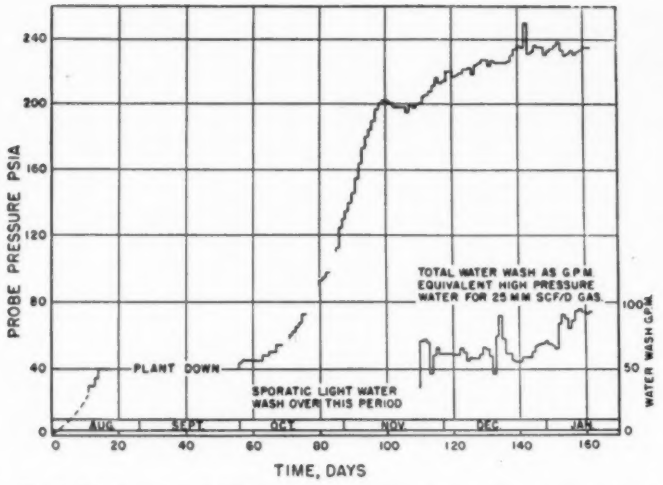

Fig. 7—Log of pressure buildup of an active probe—showing effect of water wash.

pH of the gas and water drainings indicated that much of this ammonia was being lost through extraction into the water phase drained from the accumulators following the compressors. Furthermore, vent gas lines became plugged with ammonium-carbonate deposits. Little or no ammonia was reaching equipment distant from the point of injection. In some equipment the rate of hydrogen penetration was reduced by this injection of ammonia; but, in other locations, the ammonia had negligible influence, or may even have increased the activity.

To investigate further the influence of ammonia, large quantities were injected into a column where the accumulator gas was strongly acidic and hydrogen penetration rates were high. In this instance, the test was conducted over 8 hours; and it was observed that, when neutral conditions were maintained, pressure buildup in the probe stopped. After the ammonia injection had been stopped, only a few hours were required for pressure buildup to resume in the probe.

The water-wash facilities were revamped to permit the injection of a larger quantity of water at both the low-pressure condensers and at the high-pressure condensers. More complete water washing has eliminated hydrogen activity in most locations, and has substantially reduced the activity in others. The history of a typical probe record over these periods is shown in Fig. 7. Further extension of water washing is planned so as to provide complete protection of the plant.

It seems evident, from the experience in this plant, that protection of an entire gas-recovery system by water washing in only one or two locations is not feasible unless special facilities are provided to effect the complete removal of the offending components. This may involve the use of prohibitively large quantities of water. Apparently the concentration effect, which has been so evident throughout this investigation, becomes operative, so that process streams rendered inactive early in the flow scheme are reactivated as quantities and compositions change in subsequent fractionation steps. Thus a practical system of control would consist of a fairly heavy water wash of the gas streams early in the plant flow, with additional washing at other downstream locations which are shown to be active by pressure buildup on probes. That such a system is effective has been demonstrated in one plant which has operated for some years on a deep-flashed high-nitrogen-content feed.

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CORROSION and its control

Magnesium Anodes for "Hot Spot" Protection

WHEN the "hot spots" along a bare pipe line have been located by soil-resistivity measurements, current drainage should be provided for their protection at the rate of 2 ma. per square foot. It will be necessary to provide additional current to compensate for the "end losses," or current which will unavoidably flow to the pipe in sections adjacent to those whose protection is desired. This allowance will vary with the length of the protected section and the ratio of the soil resistivities involved, over a range from 10 per cent to as high as 100 per cent for very short sections. The amount of pipe of various sizes which can be afforded the drainage desired by different sizes of anodes is as follows:

Nominal pipe size (in.)	Spacing in feet for anode weights			
	9 lb.	17 lb.	32 lb.	50 lb.
4	22	41	78	121
6	15	28	53	82
8	11	21	40	63
10	9	17	32	50
12	8	14	27	43

These figures are based on 50 per cent anode efficiency (conservative), 2 ma. per square foot, and 10-year anode life. If the soil resistivity is such that the current output is higher than the 10-year rating, a correspondingly longer section of pipe may be protected for a shorter period of time. The normal 10-year-life ratings and the soil resistivities in which they may be expected are as follows:

Anode size (lb.)	Current for 10-year life (ma.)	Soil resistivity (ohm-cm.)
9	51	3,200
17	97	1,900
32	183	1,050
50	285	720

The same data, with additional points indicated for 5-year and for 20-year life, are shown in the curves of Fig. 1. It must be emphasized that these curves, and the data in the table above, apply to one set of conditions only: 50 per cent anode efficiency, isolated anodes, and 10-ft. separation from a bare line polarized to protected potential. Higher efficiencies, which are commonly realized, will result in longer anode life; anodes installed in groups rather than singly will tend to restrict current flow to lower values than those given; placing the anodes closer to the line will result in increased current flow, up to about 50 per cent more at 2-ft. separation; and a line which is not brought up to full protective potential will draw more current than indicated, up to perhaps double under the most adverse conditions.

Anodes which are placed in soil of low resistivity that their current output exceeds that for the desired life may be controlled by the insertion in their lead wires of suitable resistors; these are usually adjusted by trial. Caution must be observed in attempting to increase the output in high-resistance soils by merely placing the anodes closer to the pipe; most of the current gained by this method will flow to the pipe in the immediate vicinity, and the sections between anodes may not receive adequate protection. Where a very narrow "hot spot" is encountered, such as a crossing salt-water ditch or drain, this device is entirely appropriate, since it concentrates the current where it is most needed.

A recommended systematic procedure is as follows:

1. From the resistivity at a certain hot spot select the anode size which can be used for the desired life.
2. Determine the number of anodes necessary to protect the section.
3. Add at least two anodes for end losses, except where (2) calls for only one, in which case one additional should suffice.
4. Determine the actual spacing to be used, placing the anodes in the proper soil. If the spacing is less than 10 ft., consider the possibility of placing alternate anodes on opposite sides of the line.
5. If the inconvenience is not too great, defer the insertion of resistors to control current output for at least 2 weeks. Otherwise, connect all of the anodes at a given location before adjusting any, and then restrict current to about 40 per cent above the desired value, to allow for reduction due to polarization of the pipe.
6. At selected locations, install a 0.01 ohm shunt in the anode lead and place in a pipe marker, so that current output may be read from time to time with a potentiometer, in order to check the performance of the system.

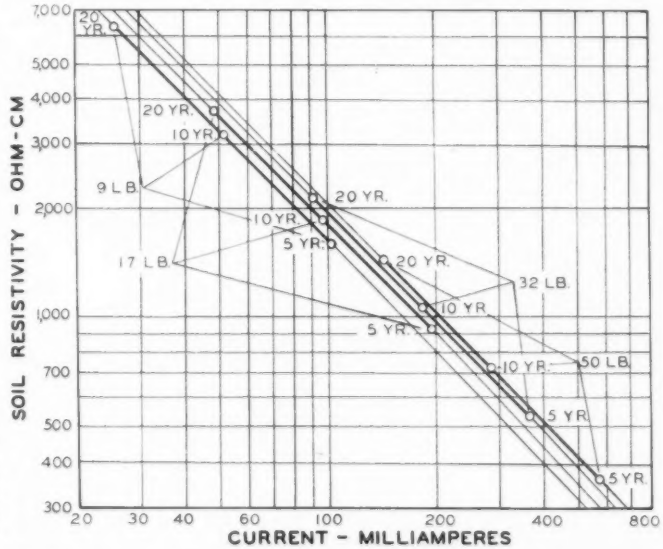

Fig. 1.—Current output and anode life as determined by soil resistivity. All data based on 50 per cent anode efficiency, isolated anodes, and 10-ft. separation from bare pipe at protected potential of 0.80 volt, referred to copper-copper sulfate electrode.

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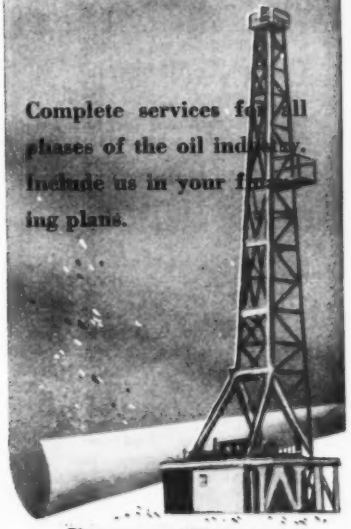

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Chemical Composition Of Crude Oils

Characterization factor is used extensively on your Questions on Technology page to describe crude oils. What does characterization factor mean with respect to the chemical composition of the crude oil? S.M.G.

Although the characterization factor was originally based on the boiling points and specific gravities of various hydrocarbons, the factor is not very significant with respect to chemical composition. The correlation index developed by the U. S. Bureau of Mines (H. M. Smith—Correlation Index to Aid in Interpreting Crude-Oil Analyses, Tech. Paper 610) is better for this purpose, although it, too, suffers from the fact that quite different mixtures can have the same average boiling point and the same specific gravity. The correlation index is a relationship between specific gravity and the reciprocal of the absolute boiling point (°K.) as indicated in Fig. 1 here. The index line of zero designates pure paraffin hydrocarbons, the 100 line applies to benzene, and the ranges of index for certain other types of hydrocarbons are:

Isoparaffins	0-12
Cyclohexanes	24-52
Monocyclic aromatics	55-100
Iso and normal olefins	4-35

and there are even more kinds of hydrocarbons. If the olefins are not present (most authorities doubt the presence of olefins in crude oils), each group of hydrocarbons occupies a fairly well-defined range of correlation index, but it is obvious that various mixtures are possible and the index can lead to erroneous conclusions regarding chemical composition. The U. S. Bureau of Mines has been clarifying this situation by publishing the indexes of each fraction of a crude-oil distillation and comparing the index versus fraction curves of various crude oils (see, for example, H. M. Smith, et al., Refining Properties of New Crudes, 4 parts, Petroleum Processing, June, July, August and September 1950).

The study of each fraction, as being developed by the Bureau of Mines, is the only logical way to approach the problem but in an attempt to indicate the meaning of the classification of crude oils according to base (paraffin, naphthene, etc.), the approximate ranges are indicated on Fig. 1.

The compositions of several crude oils are shown in Fig. 7 of Petroleum Refinery Engineering (third edition, page 87, McGraw-Hill Book Co., Inc., New York, 1949). The limiting percentage compositions of the several bases of crude oils are found to be:

	Paraffin base	Intermediate base	Naphthene base	Benzenoid base
Paraffins	45-97	25-79	15-60	2-28
Naphthenes	2-31	17-45	38-76	35-78
Aromatics	3-31	3-29	3-24	30-48

If the extremes of these compositions are analyzed for the approximate correlation indexes, the indexes generally tend to be too low, for example, indexes of only 25-47 for naphthene base and 16-46 for intermediate base. It is obvious that the percentage of paraffins is a very powerful factor in lowering the average correlation index. These values do not compare well with what the industry has thought of as characteristic of the various bases of crude oils, nor to the customary values of characterization factor used for the several bases of oils. The ranges marked on Fig. 1 are based upon characterization factors, and on the limited analyses of Petroleum Refinery Engineering.

All of the above indicates that there are even more varieties of crude oils than had been supposed and that such terms as base and characterization factor mean little. Even the correlation index must be determined for each fraction, to gain any insight into chemical composition. Undoubtedly much of the lack of consistency arises from the fact that both the correlation index and the characterization factor are based largely on the lower boiling (relatively simple) hydrocarbons rather than the highly complex little-known high-boiling hydrocarbons found in petroleum.

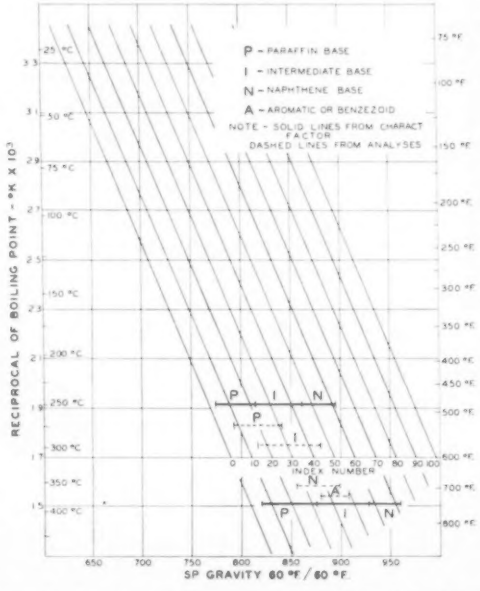
P - PARAFFIN BASE
I - INTERMEDIATE BASE
N - NAPHTHENE BASE
A - AROMATIC OR BENZEZOID
NOTE - SOLID LINES FROM CHARACT FACTOR
DASHED LINES FROM ANALYSES
RECIPROCAL OF BOILING POINT - °K X 10³
INDEX NUMBER
SP GRAVITY 60 °F / 60 °F

Fig. 1.—Comparison of base of crude oil with correlation index.

Time of Construction

I wish to secure information on the time required for refinery construction and what factors may influence the time required. Is there published information on this subject? J.E.M.

Probably nothing has been published that relates directly to this subject. Although the best sources of information are the contracting companies, even they will be confused and reluctant to state definite answers without having an outline of specific business conditions before them for consideration.

Some information might be gained by examining the trade publications for announcements of contracts and of completions, and surveys are available at regular intervals in some of the trade journals. The Oil and Gas Journal survey by R. B. Tuttle appears about each quarter, with the most recent appearing on March 29, 1951, page 343. Time lag in the receiving of replies to inquiries and the dates of publication may cause deviations of plus or minus about 5 months, but if a large number of plants are considered, the results should be reasonably accurate. Note that various business conditions are encountered and hence an identical construction job can require various lengths of time.

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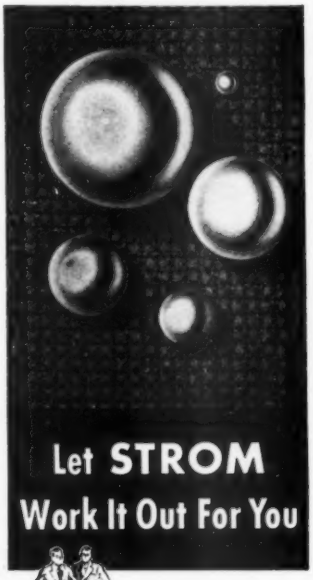

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ENGINEERING fundamentals

No. 443

Correlation of Basic Core Measurement

IT is becoming more common to obtain relative permeability, capillary pressure, and flooding data on cores, in addition to the usual porosity and permeability measurements. In a previous discussion it was indicated that both relative-permeability data and capillary-pressure data could be used to indicate relative wettability. Other information from these two tests can be correlated and this in turn might be correlated with flooding data, porosity, or permeability. It is the purpose of this presentation to enumerate some of the known or probable correlations between these basic core measurements.

Rose[1] has given a graphical representation of the correspondence between the relative permeability and capillary-pressure data. His presentation with modification is shown in Figs. 1 and 2. Both the capillary-pressure and relative-permeability curves are plotted on the same saturation axis, one above the other. Wetting fluid saturation is used. Fig. 1 showing water wet and Fig. 2 oil wet.

Common saturation points are indicated on these diagrams. For example, on Fig. 1 the irreducible minimum of water is also the point of zero water relative permeability, and on Fig. 2 the irreducible minimum of oil is the point of zero oil flow. By a flooding test of the wetting phase by the nonwetting phase these saturation points would also be anticipated. On Fig. 1, therefore, the point A would be the residual water when flooded by oil, or as has been indicated throughout the literature, this is the connate water value in a water wet sand. On Fig. 2, the point B would be the residual oil when flooding with water, or the usual residual-oil value.

In a water-wet system it is generally anticipated that a correlation between connate water (A of Fig. 1) and permeability will be found, such that the logarithm of the permeability versus the connate water approximates a straight line. (See Engineering Fundamentals No. 331). Similarly, it would be anticipated that in an oil-wet system the residual oil after water flood (point B of Fig. 2) would correlate with the logarithm of permeability to approximate a straight line.

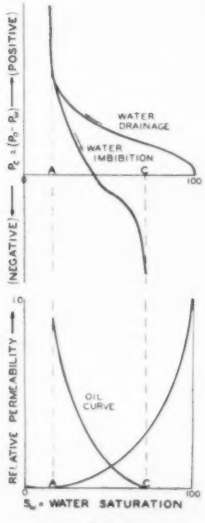

Fig. 1

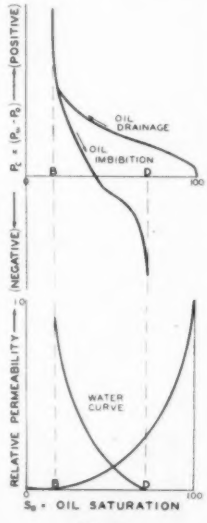

Fig. 2

In the water-wet system of Fig. 1 the residual oil after water flooding would be point C. This ideally would be either the imbibition residual from the capillary-pressure curve or the point of zero oil flow on the relative-permeability curve. The corresponding point in the oil-wet system would be point D. Point D does not necessarily indicate the connate water in an oil-wet system, however. To state that it did so would mean that the rock system was oil wet when the oil entered the system, whereas probably in all cases water was the original wetting fluid. There are no presently known emperical relationships between points C and D and other basic data such as permeability.

Correspondence Not Exact

These corresponding points are indicated from an ideal standpoint. In some instances it has been shown experimentally that the correspondence is not exact. For example, points A and B on the relative-permeability curves probably fall slightly to the right of the values given by capillary-pressure data. However, for engineering approximations, for the estimation of residual oil when flooding data is not available, or for the estimation of a relative-permeability curve these correlations are valuable aids.

In the estimation of relative-permeability curves, for example, in a water-wet system, the capillary-pressure curve (on the connate-water value) and the residual-oil value give the two zero permeability limits. The water relative permeability value at saturation of 100 per cent can be taken as unity and the oil-phase relative-permeability value can be said to approach unity at the connate-water value. (See Fig. 1). With these limits and some familiarity with relative-permeability curves, approximate relative-permeability curves can be drawn for a specific situation. Rose[1] gives a complete method for computing the relative-permeability curve from the capillary-pressure curve using a knowledge of these limits.

Reference

1. Rose, Theoretical Generalization Leading to the Evaluation of Relative Permeability, A.I.M.E. Trans. Vol. 186, 1949.

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, Penn State College

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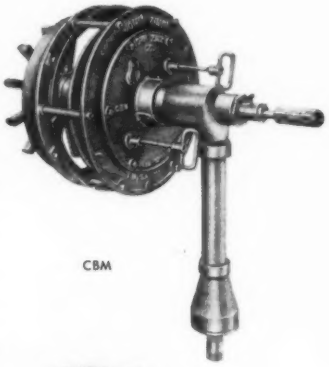

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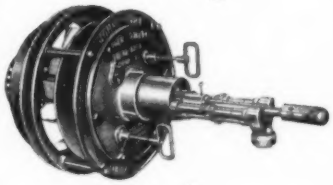

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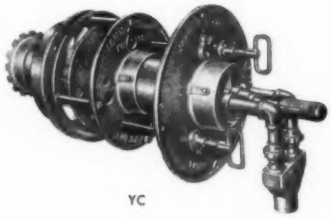

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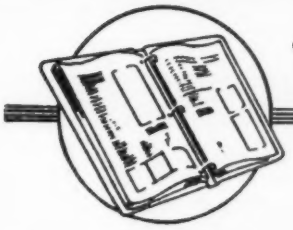


THE REFINER'S notebook

No. 71

Grease Applications*

CERTAIN factors in machine design and operation are responsible for the "consumer demands" which lubricating greases must meet. These include the load-speed relation, type of motion exerted, operating temperature, accessibility, and possibility of contamination. The three characteristics of greases which combine in various ways to meet widely divergent demands are plastic consistency, directional fluidity, and film polarity, all of which were discussed in preceding installments.

Plastic consistency means that greases normally do not flow like liquids. They are more or less plastic or semisolid and because of the butterlike quality will "stay put" in a bearing and not flow out. **Directional fluidity** means that greases can act as fluids under the influence of shearing forces, but since they do not flow laterally will stay in a bearing and seal it against contaminants. **Film polarity** is due to the polar soap molecules in the grease. These provide the grease film with the ability to adhere to metal surfaces more tenaciously than ordinary fluid lubricants. Even under very severe conditions, film polarity provides a measure of boundary lubrication.

Machine factors.—Lubrication requirements of low-speed and high-load journal bearings would not appear to be particularly critical. However, many machines, such as stone crushers and steel-mill roll stands, are also subjected to intermittent shock loads of extremely high value. Modern lubricating greases are particularly effective under these conditions since their polar soap molecules impart extremely tenacious characteristics even to grease films of almost mono-molecular thickness.

*From material prepared by Shell Oil Co. on "Fundamentals of Lubricating Greases."

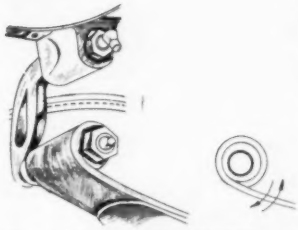


Fig. 2.—OSCILLATING BEARINGS—Although no continuous motion in a single direction exists to build up a lubricant wedge, a relative thick protective film may be maintained by a grease lubricant under shock load. This again is due to the polar attraction of the soap molecules in the grease to the metal surfaces.

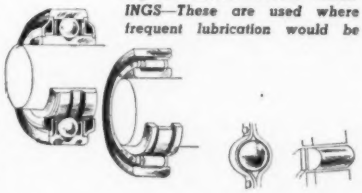


Fig. 3.—ANTIFRICTION BEARINGS—These are used where frequent lubrication would be impractical or delivery of a fluid lubricant would be difficult, as in automobile front-wheel bearings. The "stay put" property of greases is important here. Antifriction bearings under heavy shock loads are protected by the cushioning effect of the relatively thick grease film. Greases are also used in the "life lubricated" antifriction bearings.

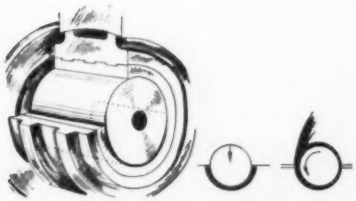
At the other extreme, the normal lubrication requirements of high-speed and low-load antifriction bearings are complicated by the factor of centrifugal force. In such applications as the spindles of textile machines, the centrifugal forces often reach very high values. Again the polar nature of the soap molecules in grease maintains at least an ultrathin, protective film on the bearing surfaces.

In such mechanisms as automobile-spring shackles the motion obviously is oscillating. This type of motion prevents formation of a lubricant "wedge" and the normally required full film lubrication, such as would occur with rotary motion. Once more, it is through the polar attraction of the soap molecules that the grease stays put and maintains a protective film.

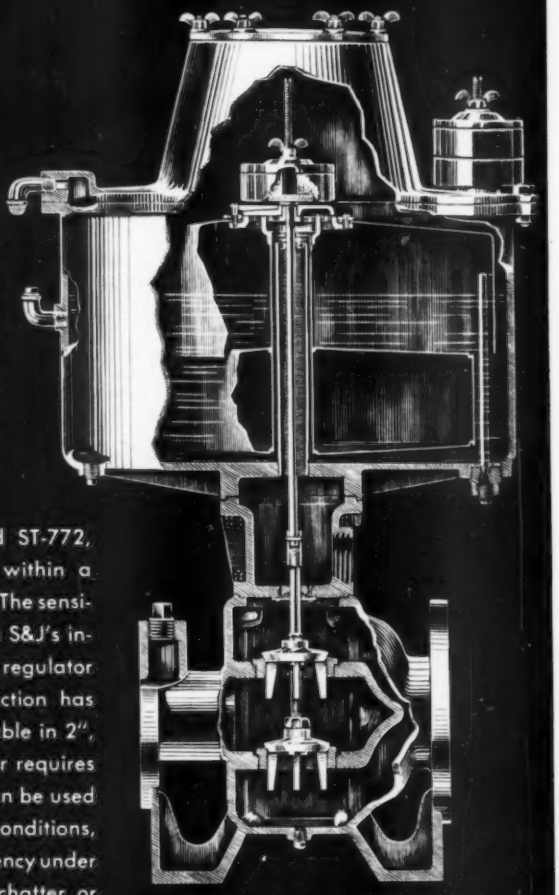
Antifriction bearings.—Ball and roller bearings substitute rolling friction for sliding friction, although it is true that some high-speed, low-load sliding friction will still exist. Many modern machines of widely varying types are now using so-called "life sealed," prelubricated antifriction bearings. In grease-lubricated bearings, the best conditions are found when the grease forms a "groove" through which the rolling members pass without churning or working the lubricant. The contact of the rolling members with the grease is just sufficient to keep them coated with a thin film of lubricant which lubricates sliding contacts and cushions the bearing parts against shock loads. There is relatively little fluid friction. Since only the thin films are involved an infinitesimal part of the grease is being "used" at any one time.

The manufacture of the life-sealed prelubricated bearings is made possible by the stay-put characteristics of the grease, together with the relative absence of fluid friction and the fact that the bulk of the grease is not worked. These bearings are prelubricated by packing with grease at the factory and except under unfavorable conditions of operation require no further lubrication during the life of the machine. Because of the plastic body of lubricating greases, bearings packed with grease are not as difficult to seal against leakage as are fluid lubricants.

Fig. 1.—JOURNAL BEARINGS—A protective "polar held" film on the bearing surfaces and good boundary lubrication are assured by a suitable grease even when the bearing operates at slow speed when heavily loaded or subjected to shock loads. Bearing is also sealed by grease against entry of contaminants. Conditions of extremely high temperatures and moisture are encountered by using a heat-stable, water-resisting grease.



KEY TO VAPOR RECOVERY



In vapor recovery systems, which frequently amortize their cost in less than one year, it is the vapor recovery regulator that is the key to increased profit from operations. The regulator must provide the maximum in sensitivity and absolute dependability in responding instantly to minute variations in either pressure or vacuum conditions in a tank. Shand & Jurs' Supersensitive Vapor Recovery Regulator fits these specifications to a "T."

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REFINING

Standard Expands

30,000 bbl. increase set for Sugar Creek plant

CHICAGO. — Crude - processing capacity of the Standard Oil Co., (Ind.) refinery at Sugar Creek, Mo., will be increased this year and next from 38,000 to 68,000 bbl. per day, according to Dr. M. G. Paulus, vice president in charge of manufacturing.

A large combination crude-running and coking unit, the major facility to be installed, will be located adjacent to the catalytic cracking and vapor-recovery units installed at Sugar Creek in 1948. Several existing auxiliary processing units will undergo capacity increases and additional tankage will be constructed. The new facilities will be served by new steam and power-generating equipment.

1952 completions. — Preliminary construction work is already under way, but major construction activity will not be initiated until later this year. The expansion will be completed by the end of 1952, Paulus said, if no delays are encountered in obtaining necessary construction materials.

Paulus said the Sugar Creek refinery was selected for the expansion because of its favorable strategic location and the present availability there of catalytic cracking capacity required for balanced operations at the higher throughput. Also product-distribution facilities in the area could be expanded and used to good advantage.

A new building to serve increased needs of management, engineering, and research personnel, along with new maintenance shop facilities for the mechanical division, will be erected as part of the program.

Pressure Tar to Carbon Black

Construction is progressing on a new plant at El Dorado, Ark., in which Columbian Carbon Co. will employ a new process to convert heavy thermal - cracked petroleum fractions to carbon black.

The furnace-type process will charge about 800 bbl. per day of heavy "pressure tar" produced from the combination thermal cracking unit at the nearby 30,000-bbl. per day refinery of Pan-Am Southern Corp. The plant will produce an estimated 135,000 lb. per day of fast extrusion furnace "F.E.F." black, a type employed in the manufacture of synthetic GRS rubber.

Using a newly developed type of

SISTER CAT.—Integration of this 9,300-bbl. catalytic cracking unit recently placed on stream and dedicated at Pan-Am Southern Corp.'s El Dorado, Ark., refinery with a cracker previously installed has given the company a completely balanced plant. Completion of the new cracker marked the completion of the first phase of Pan-Am's 5-year, multimillion-dollar expansion program in the South.

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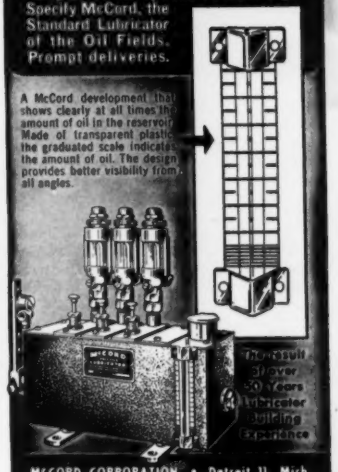
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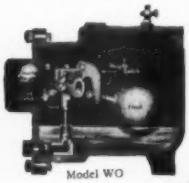

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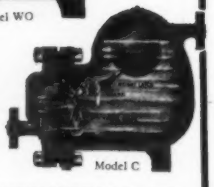

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burner, the process will employ conventional three-stage cyclone separation of black product and will be equipped with a Wheelebrator Bag Collector. Ford, Bacon & Davis of New York have contracted to construct the plant. Erection has been delayed by adverse weather, but initial operation is anticipated for September 1.

The new plant will take the bulk of the heavy residual fraction from Pan-Am's thermal cracking operation. This arrangement, plus the new delayed coking operation which Pan-Am recently placed on stream, will reduce the company's residual yield to a negligible figure.

Alkylation Unit Reactivated

Pan-Am Southern Corp. has revived alkylation operations in the 1,475-bbl. per day HF alkylation built at the El Dorado, Ark., refinery during the last war. Operation of the unit has been simplified by modifications made by Pan-Am engineers.

Charging butylenes and isobutane the unit will produce aviation alkylate and will balance the operations of a polymerization unit, a combination thermal cracker, a new delayed coker, and two fluid catalytic cracking units, one of which was very recently placed in initial operation.

Oil-Tax Collections Up

WASHINGTON. — Collections from the three federal oil taxes during the first three quarters of the Government's current fiscal year were nearly $42,000,000 above those for the same period a year ago, according to the Internal Revenue Bureau.

Receipts for the month of March, however, were nearly $15,000,000 under the same month last year—gasoline revenue dropping from $53,983,522 to $37,593,597 and lubricating oil from $7,860,833 to $4,865,218, while only pipe-line transportation showed an increase, from $1,467,100 to $2,180,417.

The bureau's report disclosed that 9-month revenue from gasoline was $425,938,278 compared with $406,086,272 a year ago, lubricating oil returned $74,560,025 against $56,948,695, and pipe-line transportation paid $18,478,636 against $14,029,167.

Refining Briefs

New Mexico Asphalt & Refining Co., Artesia, N. M., is nearing completion of a $2,500,000 expansion program at its Artesia plant, according to A. R. Matthews, president. The program includes the installation of a T.C.C. unit, a catalytic-polymerization plant, feed-preparation unit, and a gas-recovery system. The company also plans to enlarge its gathering system to Eddy County pools.

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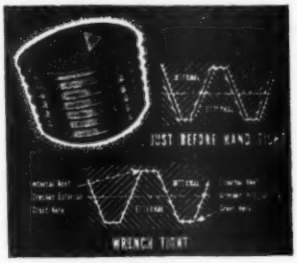

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PIPE LINES

United Project Progresses

SHREVEPORT.—Construction work on United Gas Pipe Line Co.'s present project to bring gas from fields in Plaquemines Parish, Louisiana, to tie in with the existing New Orleans district system is going ahead rapidly.

The project includes the laying of 68.1 miles of 16-in. transmission line, and 25.5 miles of 12, 10, 8, and 6-in. gathering lines.

All pipe has been delivered to the Harvey, La., plant of H. C. Price Co., and application of coating has been completed.

Construction of two submarine crossings of the Mississippi River by J. Ray McDermott Co., of Harvey, have been completed. They consist of a dual 10-in. crossing near Venice, La., and a single 8-in. crossing near Pointe a la Hache, La.

Work has begun on the Venice field 12-in. line, the Venice field-West Bay field 10-in. line, and on sections of the 16-in. line between Pointe a la Hache and Venice Junction and between Pointe a la Hache Junction and Delacroix field. Brown & Root, Inc., Houston, has contract.

Approximately 39.25 miles of canal excavation and drag-line ditches has been completed, and added concrete coating has been applied over approximately 29.5 miles of line to provide additional weight.

Price Spreads Kick Off

Two H. C. Price Co. spreads have kicked off on a 157-mile, 24-in. section of the Tennessee Gas Transmission Co. line extending east from Hamburg, N. Y. Operations are proceeding under G. A. Reutzel at Auburn and R. K. Shivel at Warsaw. The 373-mile, 26-in. section of Tennessee's line from Portsmouth, Ohio, to Hamburg was completed last winter.

Two Price spreads are based at Nacogdoches, Tex., under C. R. Ice and at Carthage, Tex., under Clarence Shivel for the laying of a 200-mile, 30-in. section for Texas Illinois Natural Gas Pipeline Co. This section, to be completed in July, is part of 480 miles of line contracted by Price for Texas Illinois. H. C. Price Co. is not connected with any recently organized pipe-line-construction company.

More Welding Rods Sought

Pipe Line Contractors Association is discussing with Petroleum Administration for Defense the need for having more steel allocated for manufacture of welding rods in order to relieve an imminent shortage, according to Richard A. Gump, executive secretary of the association. Estimates based on last year's output indicate that demand for welding rods this year is running 30 per cent ahead of current provisions for supply.

Dow Lines Near Completion

SHREVEPORT — Construction is virtually complete on 51.3 miles of the Dow Chemical Co. pipe line from Needville to Freeport, Tex., United Gas Pipe Line officials have announced.

The line comprises 48.9 miles of

SINKERS.—H. C. Price Co. workers bolt together huge cast-iron river weights on section of Texas-Illinois Natural Gas Pipeline Co.'s line from the Gulf Coast to Joliet, Ill., now under construction. More than twenty 30-in. anchoring clamps were required in this short swampy interval.

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20-in. and 2.4 miles of 16-in. pipe. From existing facilities near Needville to the Dow Chemical plant at Freeport, the project also includes a 16-in. dual submarine crossing of the Brazos River.

United Gas officials said construction is complete with the exception of tie-in work and testing. Contract for construction was awarded to the Texas-Louisiana Contractors, of Fort Worth.

Plantation Doubles Stations

Plantation Pipe Line Co. will build twice as many stations as were originally contemplated on its 707-mile project now being built to parallel the company's products line from Baton Rouge, La., to Charlotte, N. C. *(The Oil and Gas Journal, July 13, page 106, and March 1, page 93.)*

C. R. Younts, president of Plantation, said stations will be placed at 60-mile intervals instead of the previously planned 120-mile spacings. The additional stations will increase investment by approximately $4,000,000 for the expansion program which will raise capacity to 221,000 bbl. of products daily.

Northern Plans Gas Line

RAWLINS, Wyo.—A new company, Northern Gas Co., of Casper, has been formed to build an 82-mile, 6-in. natural-gas line from Sand Draw and Beaver Creek fields in Fremont County, Wyoming, to this city.

Application for construction permit has been filed with the Wyoming Public Service Commission, and construction of the $900,000 line will begin as soon as the project is approved by the commission.

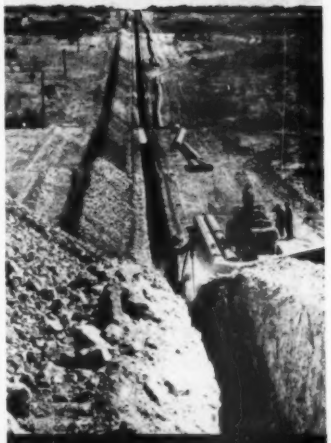
Gas for the line will be furnished by Northern Utilities.

Pipe-Line Briefs

Shell Pipe Line Corp. is laying approximately 4 miles of 4-in. and 2½ miles of 6-in. gathering lines to move oil from Pembrock field in Upton County, Texas, to the company's Upton station. A. F. Terrell area manager for Shell Pipe Line at Colorado City, Tex., said the company currently was trucking oil from some producers in Pembrook field to the Upton Station where it is turned into the main line to the Midwest.

Jim McCormick & Co., San Angelo, has contract from Humble Pipe Line Co. to lay 16 miles of 6 and 8-in. pipe line from Cree-Sykes field in Runnels County, Texas, to connect with Humble's pipe line from Fort Chadbourne field to the Ballinger, Tex., pump station. Work on the new line was to start immediately and be completed in 30 days. The line also will serve producing areas between Cree-Sykes field and its junction with the larger carrier.

Getting rock out of ditch for a 22" pipeline in the Southwest.



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Pipe-Line Construction

FOLLOWING is a tabulation of pipeline projects which are planned or under construction. Included are crude-oil, products, and natural-gas lines. The list was compiled from surveys made by The Oil and Gas Journal.

Crude-Oil Pipe Lines

Alberta-Vancouver Oil Pipe Line Co. (Brokaw, Dixon, McKee).—972 miles, 16-in., proposed, Edmonton via Pincher Creek, Alta., Idaho and Washington states to Vancouver, B. C.

General Petroleum Corp.—42 miles, 8-in., under way, San Ardo to Estero Bay, Calif.; Bechtel Corp.; San Miguel, field office; J. S. Connell and George Anderson, superintendents.

Phillips Pipe Line Co.—35 miles, 10-in.; authorized; Brownfield, Tex., to Plains, Tex.

Phillips Petroleum Co.—278 miles, 10-in., under way, Borger, Tex., to Yale, Okla.; Brown-Lite Co., Tulsa, and Arey-Phillips Construction Co., Pampa, Tex., contractors.

Phillips Pipe Line Co.—145 miles, 10-in., under way, Borger, Tex., to Clinton, Okla.; Arey-Phillips Const. Co.; Sayre, Okla., field office, H. V. Gorman, spreadman.

Phillips Pipe Line Co.—137 miles, 10-in., under way, Yale to Clinton, Okla.; Brown-Lite Co.; El Reno, Okla., field office, Carlis Gayhart, spreadman.

Phillips Pipe Line Co.—53 miles, 8-6-in., under way, Wheeler to Sweeny, Tex.; O. R. Burden Construction Co.

Phillips Pipe Line Co.—24 miles, 8-in., under way, Thrall to Kansas City, Kans.; C. H. Gragg Construction Co.

Phillips Pipe Line Co.—Proposed, Midland, Glasscock, Reagan, and Upton counties.

Platte Pipe Line Co.—1,075 miles, 16-20-in., contracted, Worland, Wyo., to Wood River refining area in Illinois. Contracted as follows: 552 miles, Chatham, Wyo., to Holdredge, Neb., R. H. Fulton & Co., (Sections 1, 2, 3, and 4—section 1, 126 mi., of 16-in.—remainder 20-in.); 142 miles, 20-in., near Marysville, Kans., to Holdredge, Nebr., Bishop & Lock. H. LaQuey, spreadman, (Section 5); to begin May 1951; 100 miles 20-in., northern edge of Kansas, Rumsey Brothers, (Section 6); 274 miles, 20-in., State of Missouri, O. R. Burden, (Sections 7 and 8).

Progress Co.—900 miles, 20-in., proposed, Permian basin, West Texas to California.

Service Pipe Line Co.—135 miles, 8-10-in., planned, Old Glory field to Bowie, Tex.

Sinclair Pipe Line Co.—700 miles, 22-in., planned; Drumright, Okla., to Chicago.

Texas-New Mexico Pipe Line Co.—75 miles, 8-in., planned, Midland to Germania pool; Midland to Scarborough and Sweetie Peck area; and Crane station to McElroy area, West Texas.

Texas-New Mexico Pipe Line Co.—55 miles, 8-in., planned, Eunice to Covington and Saunders area, New Mexico.

Texas Pipe Line Co.—56 miles, 12¾-in., Chico to Wichita Falls, Tex.; R. H. Fulton & Co., contractor; M. L. Boyd, spreadman, Henrietta, Tex.

Trans-Mountain Oil Pipeline Co. (Sponsored by Bechtel Corp.)—715 miles, under way by July 1951, Edmonton, Alta., via Yellowhead Pass to Vancouver, B. C.

West Texas Gulf Pipe Line Co.—450 miles, 26-in., authorized, Colorado City to Wortham, Tex., 26-in.; Wortham to Sour Lake, Tex., 24-in.

West Texas Gulf Pipe Line Co.—18-in., authorized, Wortham to Longview, Tex.

Products Pipe Lines

Bell Oil & Oil Co.—150 miles, 6-in., planned, Ardmore to Drumright, Okla.

Buckeye Pipe Line Co.—430 miles, 14-in., proposed, Linden, N. J., to Allentown, Pa., Junction; Chelsea, Pa., via Allentown Junction to Auburn, Rochester, Syracuse and Oswego, N. Y. Start 1952; finish 1953.

Great Lakes Pipe Line Co.—355 miles, 12-in., authorized, Kansas City through Omaha and Sioux City Iowa, to Sioux Falls, S. D.

Great Lakes Pipe Line Co.—119 miles, 8-in.; planned; Des Moines to Iowa City.

Miami-Valley Corps.—58 miles, 8-in., under way, Dayton to Cincinnati, Ohio; Anderson Brothers Co.

Phillips Petroleum Co.—50 miles, 8-in., looping in Okla., Kans., Mo.; Gragg Const. Co.; Valley Park, Mo., field office, L. E. Warner, spreadman. Completion date 5-1-51.

Plantation Pipe Line Co.—707 miles, 14 and 18-in., contracted, Baton Rouge to Charlotte, N. C., 275 miles, 14-in., under way, Bremen to Charlotte, N. C.; 432 miles, 18-in., under way, Baton Rouge to Bremen, Ga.; 220 miles, 18-in., Baton Rouge to Mississippi-Alabama state line; Williams Brothers Co. David R. Williams, Jr., project manager, George Allen, spread superintendent, Tuscaloosa, Ala.; T. E. Davis, spread superintendent, Talledega, Ala.

Progress Co.—900 miles, 10-in., proposed, California to West Texas.

Pure Transportation Co.—100 miles, 6-in., under way, Heath to Dayton, Ohio; Wabash Construction Co.

Salt Lake Pipe Line Co.—Proposed, Pasco, Wash., to Puget Sound.

Standard Oil Co. (Ind.).—50 miles, 8-in. under way, north of Sugar Creek, Mo., refinery; Lawhon Construction Co., Southern Mill & Mfg. Co., contractors.

Standard Oil Co. (Ind.).—144 miles, 8-in., authorized, Neodesha, Kans., to Sugar Creek, Mo.

Texas Pipe Line Co.—56 miles, 10 in., under way, Lawrenceville, Ill., to Mt. Vernon, Ind.; O. R. Burden Construction Corp., contractor; O. P. Hines, spreadman; Mt. Carmel, Ill., field office.

Triangle Pipe Line Co.—100 miles, 10-in, planned, Eldorado, Ark., to point on Mississippi River.

Tuscarora Oil Co., Ltd.—27 miles, 8-in., contracted, Pittsburgh Junction, Pa.; to Midland, Pa.; 34 miles, 10-in., contracted, Knappenberger Scraper Trap to Pittsburg Junction, Pa.; 26 miles, 10-in., contracted, Barneytown Scraper Trap to East Freedom Pa.; Pipe line Construction & Drilling Co

Natural-Gas Pipe Lines

Algonquin Gas Transmission Co.—278 miles, proposed, Greenwich, Conn., to Boston area; 492 miles, proposed, laterals New England area.

Amere Gas Utilities Co.—15 miles, 8-in., authorized, KA-8 Flat Top to Beckley W. Va. Completion date June 1951.

Amere Gas Utilities Co.—11 miles, 8-in., authorized KA-5 loop, Priceton and Athens W. Va. Completion date December 1951.

Atlantic Gulf Gas Co. (United Gas Pipe Line Co.).—1,530 miles, planned, Alabama-Florida-Georgia-South Carolina.

Carolina Natural Gas Corp.—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

Central Kentucky Natural Gas Co.—12 miles, 20-in., line E loop, Means to Foster, Ky. Completion date October 1951.

Central Kentucky Natural Gas Co.—15 miles, 20-in., Cold Spring, Ky., to Anderson's Ferry, Ohio. Completion date December 1951.

Central Kentucky Natural Gas Co.—18 miles, 12-in., Winchester to Lexington, Ky.

Cities of Booneville and Baldwin, Miss.—96 miles, ¾ and 6-in., under way, Booneville and Baldwin, Miss.; M. L. Hulcher Co. Inc., contractor, Sam Carnahan, spreadman Completion date November 1, 1951.

Cities Service Gas Co.—29 miles, 16-in., under way, Hesston to Wichita, Kans.;

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Knupp Const. Co.; Newton, Kans., field office, Cliff Harris, spreadman.

Cities Service Gas Co.—66 miles, 6-7-8-10-in., under way, takeup Hutchinson to Wichita, Kans.; Knupp Const. Co.; Newton, Kans., field office, Cliff Harris, spreadman.

Cities Service Gas Co.—40 miles, 4-10 in., Kansas, field office, Liberal; Pat Gilmore, spreadman; Knupp Construction Co., Inc., contractor.

Cities Service Gas Co.—56 miles, planned, Sedgwick, Harvey, and Labette counties, Kansas.

City of Alabama.—84 miles, 2 to 8-in., under way, Alabama; Modern Welding Co., Inc., contractor, D. D. Foreman, spreadman. Completion date October 1951.

Coast Counties Gas & Electric Co.—40 miles, 3, 4, and 8-in., planned, Coast and Valley region, California.

Colorado Interstate Gas Co.—215 miles, 20-in., planned, Texas Panhandle to Colorado.

Commonwealth Natural Gas Corp.—69 miles, 12¾-in., under way, Petersburg, to Norfolk, Va.; Ray L. Smith, contractor.

Commonwealth Natural Gas Corp.—14 miles, 8-in., under way, Suffolk to Newport News, Va.; Ray L. Smith, contractor.

Commonwealth Natural Gas Corp.—10 miles, contracted, laterals—Richmond, Suffolk, and Portsmouth, Va.; Ray L. Smith, contractor.

Commonwealth Natural Gas Corp.—99 miles, 18-in., under way, Stanardsville to near Petersburg, Va.; Ray L. Smith & Son, contractor, Don C. Smith, Orange, Va., spreadman.

Commonwealth Natural Gas Corp.—537 miles, 20-in., proposed, West Bend, Ky., to Norfolk, Va.

Delhi Oil Co.—68 miles, 8-in., under way, Laredo to Lopeno, Tex. Altgelt Const. Co. contractor, Laredo, Tex., field office, Lee Phillips, spreadman. Completion date 4-1.

East Tennessee Natural Gas Co.—172 miles, 22-in., proposed, Greenbrier to Oak Ridge, Tenn.

Egyptian Natural Gas Co.—80 miles, 6-8-in., authorized, Norris City to Salem-Centralia, Ill., area.

El Paso Natural Gas Co.—122.9 miles, 30-in., proposed, looping along main line in Texas, New Mexico, Arizona.

El Paso Natural Gas Co.—470 miles, 24-in., under way, San Juan basin, New Mexico, to Franconia, Ariz.

Grand Valley Pipe Line Co.—105 miles, 8-10-in., planned, Piceance Creek field to Rifle on to Grand Junction, Colo.

Gulf Michigan Transmission Corp.—680 miles, 30-in., proposed, Perryville, La., across Arkansas, Missouri, and Illinois to terminus near St. John, Ind.

Hope Natural Gas Co.—32 miles, proposed, Fairmont to Terra Alta, W. Va.

Hugoton Production Co.—40 miles, 20 to 4-in., under way, near Ulysses, Kans., gathering system. Reese Bros. Const. Co., contractor, Hugoton, Kans., field office, Paul G. Reese, spreadman.

Humble Oil & Refining Co.—42 miles, 10-in., under way, Anahuac Gasoline Plant near Anahuac, Tex., to Gulf States Utilities plant near Beaumont, Tex.; Houston Contracting Co.; Winnie, Tex., field office; J. A. Cantrell, superintendent.

Kansas-Nebraska Natural Gas Co.—60 miles, 8-10-12-in., under way, Grand Island to Albion, Neb.; 40 miles, 6-in., under way, Albion to Norfolk, Neb.; 26 miles, 6-in., under way, Albion to Neligh, Neb. Jayhawk Const. Co., Inc., contractor, T. L. Hickerson, spreadman.

Kansas-Nebraska Natural Gas Co., Inc.—22 miles, 12-in., planned, Holcomb to Scott City, Kans.; 12 miles, 12-in., planned, Blakeeney to Palco, Kans.; 34 miles, 12-in., planned, Palco to Phillipsburg, Kans.; 10 miles, 12-in., planned, Alma to Holdredge, Neb. (replacement lines). Neb., 39 miles, 4 and 6-in., planned, Neligh to O'Neill, Neb., 54 miles, 4 and 6-in., planned, Neligh to Hartington, Neb. (extension).

Manufacturers Light & Heat Co.—172 miles, 16-20-24-in., proposed, Clinton County, Pennsylvania, to vicinity of Pittsburgh, Pa.

Manufacturers Light & Heat Co.—50 miles, contracted, near Pittsburgh, Pa.; 75 miles, near Bradford, Pa.; Britton Contracting Co., contractor.

Michigan Consolidated Gas Co.—180 miles, 24-in., planned, Austin, Mich., to Detroit.

Mid-South Gas Co.—40 miles, 12-in. Helena to Forrest City, Ark.; Tulsa Construction Co., contractor; Frank McCoy, spreadman, field office, Marianna, Ark.

Mississippi River Fuel Corp.—98 miles, 16 and 18-in., proposed, feeder line from Lincoln Parish, La., to Waskom field, Harrison County, Texas.

Mississippi River Fuel Corp.—40 miles, 18-in., authorized, Dubach to Perryville, La.

Missouri Central Natural Gas Co.—30 miles, 6⅝-in., contracted, Macon to Moberly, Mo.; L. R. Young Construction Co.

National Utilities Co. of Michigan.—76.7 miles, 20-in., proposed, South Central Michigan. (22 miles from near Marshall south to Coldwater; 20 miles east to Hillsdale; 22 miles southwest to Sturgin; 5 miles from Hillsdale to Jonesville and 6 miles west to Union City.)

Nevada Natural Gas Pipe Line Co.—114 miles, proposed, Topock, Ariz., to Las Vegas, Nev.

New River Gas Co.—50 miles, planned, Summers or Monroe counties, W. Va., to Narrows and Dublin, W. Va.

New York State Natural Gas Corp.—39 miles, 20-in., proposed, Potter County, Pennsylvania, to Livingston and Monroe counties, New York.

New York State Natural Gas Corp.—26 miles, 20-in., authorized, New Kensington to South Bend, Pa.

New York State Natural Gas Corp.—51 miles, 20-in., authorized, New Kensington, Pa., to Ohio line.

New York State Natural Gas Corp.—27 miles, 16-in. authorized, looping in Greene and Westmoreland counties.

New York State Natural Gas Corp.—70 miles, 20-in., planned, North Oakford, Pa., to Ohio state line.

New York State Natural Gas Corp.—62 miles, 20-in., under way, Murrysville, Pa., to Petersburg, Ohio; 37 miles, 20-in., under way by May, Boome storage field to Ithaca, N. Y. Field office, Lawrenceville, Pa. Completion date October 1951; 23 miles, 20-in., contracted, state line station to Angelica, N. Y. Office, Wellsville, N. Y. Completion date October 1951: 83½ miles, 20-in., under way by May, Utica to Ithaca, N. Y. Field office, Clinton, N. Y., Leman Creech, supt.; 85 miles, 16-in., under way by September, Utica to Albany, N. Y.; Williams-Austin Co., contractor, Ed Peters, over-all general supt.

Niagara Mohawk Power Corp.—40 miles, 10-12-16-in., under way by April 1, lateral lines at Utica, N. Y.; 55 miles, 10-in., Fulton to Watertown, N. Y.; Williams-Austin Co., contractor, Howard Bauer, supt.

Northeastern Gas Transmission Co.—511 miles 20-24-in., authorized, New Hampshire, Massachusetts, and Connecticut.

Northeastern Gas Co.—411 miles, proposed, New England towns.

Northern Natural Gas Co.—580 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska loops.

Northern Natural Gas Co.—370 miles, 4-26-in., authorized, gathering lines in Hugoton field.

Northern Natural Gas Co.—210 miles, 26-in., proposed, five loops in Texas-Oklahoma area, two in Kansas, and two in Nebraska

Northern Indiana Fuel & Light Co.—33 miles, 8-in., proposed, Edgerton to Auburn, Ind.

Northwest Natural Gas Co.—750 miles, planned, Washington, Oregon, and Idaho.

Ohio Fuel Gas Co.—20 miles, 20-in., under way, New Albany to Homer, Ohio; Somerville Const. Co.; Harold Cook, spreadman. Completion date 6-1-51.

Ohio Fuel Gas Co.—22 miles, 16-in. authorized, Dayton, Troy, Piqua, and Sidney, Ohio.

Ohio Fuel Gas Co.—61 miles, proposed, northern and southwestern Ohio.

Oklahoma Natural Gas Co.—40 miles, 16-in., Velma to Chickasha, Okla.; Trojan Construction Co., contractor.

Oklahoma Natural Gas Co.—53 miles, 26-in., under way, Edmond to Depew, Okla.; Trojan Construction Co., contractor; "Swede" Tillotson, spreadman; Stroud, Okla., field office.

Oklahoma Natural Gas Co.—40 miles, 16-in., planned, Ninnekah, Okla., to County Line, Okla.; Trojan Construction Co., contractor.

Pacific Gas & Electric Co.—47 miles, 8-in., authorized, Salina to Kilig City, Calif.

Pacific Gas and Electric Co.—141 miles, 34-in., proposed, parallel sections along Topock-Milpitas line.

Pacific Northwest Pipe Line Co.—400 miles, 22-in., gathering lines on Texas Gulf Coast to Pacific Northwest pipe line.

Pacific Northwest Gas Pipe Line Corp.—2,175 miles, planned, Wharton County, Texas, via Oklahoma, Kansas, Fort Collins, Colo., to Portland, Ore., Tacoma and Seattle, Wash.

Panhandle Eastern Pipe Line Co.—174 miles, 30 and 26-in., contracted, Tuscola Ill., eastward—looping present system; R. A Conyes, contractor, 44 miles, 26-in., Edgerton, Mich.; 22 miles, 30-in., looping in Tuscola, Ill.; 45 miles, 30-in., looping in Montezuma, Ind.; 63 miles, 30-in., looping in Zionsville, Ind.

Pennsylvania Gas Co.—52 miles, 12-in., between Warren and Erie, Pa.

Phillips Petroleum Co.—118 miles, 3-22-in., under way, Sherman and Hansford counties, Texas gas-gathering system; Vaughn & Taylor Construction Co., Inc., Dumas, Tex.

Piedmont Natural Gas Co.—28 miles, 6-in., proposed, North Carolina—laterals from Transcontinental gas system.

Potomac Gas Co.—18 miles, 16-in., Dranesville to Arlington, Va.

Prince George's Gas Corp.—20 miles, 22-in., authorized, between Chillum and Rockville, Md.

South Central Alabama Natural Gas Co., Inc.—150 miles, proposed, central Alabama.

South Georgia Natural Gas Co.—248 miles, planned.

Southeastern Michigan Gas Co.—55 miles,

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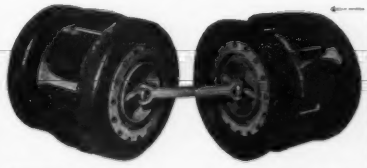
←4" Size—TYPE JRN—2" to 4" sizes. Will pass 1½R-90° Bends. No valves other than full diameter thru-port valves. Use TYPE SCN-51 for 6" Size.

←8" Size—TYPE WC-11—8" to 14". Will traverse 6 foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.

←20" Size—TYPE GP-2—16" to 30". 200-LB. SPRING Forces the Brushes against pipe wall—COMPENSATING for WEAR. Will traverse round-opening gate valves. SPRINGS and BRUSHES are identical and interchangeable for all types and sizes of GP PIGS.



←24" Size—GP-3—18" to 30" Sizes will pass 1½R-90° Bends. SPRINGS COMPENSATE For BRUSH WEAR, ASSURING Full section cleaning efficiency. GP-3 consists of two Type GP-1 Pigs.—Each Unit may be used as individual pig.

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12¾-in.; under way; from point near Clawson, Mich., to Port Huron, Mich.; H. L. Gentry Construction Co., contractor; field office, Utica, Mich.; spreadman, Frank Morris. Completion date 5-15-51.

Southern Natural Gas Co.—120 miles, 18-in.; under way; Mitchell Village, Ala., to Bolingbroke, Ga.; Associated Pipe Line Contractors, Inc., contractor; Columbus, Ga., field office; Lacy Walker, spreadman.

Southern Natural Gas Co.—138 miles, 20-22-in., planned, Chattanooga, Tenn., to Lexington, Miss.

Southern Natural Gas Co.—375 miles, 24-in., planned, Gwinville, Miss., to Atlanta, Ga.

Southern Natural Gas Co.—169 miles, proposed loops, Ouachita Parish, Louisiana, to Augusta, Ga.; 20 miles in Ouachita Parish, 33 miles in Ouachita and West Carroll parishes; 7 miles, Sharkey County, Mississippi; and 108 miles, 14-in., Bass Junction to Augusta, Ga.

Southwest Gas Corp., Ltd.—26 miles, proposed, from P. G. & E. line to Victorville, Calif.

Sunray Oil Corp.—133 miles, 3-30-in., system for Snyder gasoline plant, Vaughn & Taylor Construction Co., contractor. D. D Vaughn, spreadman.

Tennessee Gas Transmission Co.—992 miles, 30-in., planned, first 150 miles of loops to be laid at Monroe, La., Greenville, Miss., Midland and Portland, Tenn.

Tennessee Gas Transmission Co.—438 miles, planned, looping on Buffalo and New England extensions.

Tennessee Gas Transmission Co. and Northeastern Gas Transmission Co.—175 miles, 24-in., under way, Albany, N. Y., near Wilmington (Boston area), Mass. Oklahoma Contracting Co., contractor, Springfield, Mass., headquarters, Paul R. Halbert, manager, H. A. Wylie, spreadman at Pittsfield, Mass., Aldress Kilgore, spreadman at Westfield, Mass. L. B. Rea, spreadman.

Tennessee Gas Transmission Co.—304 miles, 24-in., proposed, between Mercer, Pa., and Utica, N. Y.; 528 miles, proposed, loops; 200 miles, proposed, miscellaneous lateral lines.

Tennessee Gas Transmission Co.—158 miles, 30-in., under way, vicinity of Jones, La., on the north to near Cypress, Tex., on the south; Houston Contracting Co. Four spreads located as follows: North end work at Bastrop, Tex., W. H. Hayes and M. L. Thompson, superintendents; center section at Natchitoches, La., E. C. Norris and R. E. Thornton, superintendents; south end at Conroe, Tex., F. A. Silar, superintendent.

Tennessee Gas Transmission Co.—64 miles, 26 and 30-in., loops, contracted, South Texas. Oklahoma Contracting Co., contractor, field office, Falfurrias, Tex., Panama Shiflett, superintendent.

Tennessee Gas Transmission Co.—156 miles, 24-in., under way, Hamburg to Onondaga-Madison County line, N. Y.; H. C. Price; Auburn and Warsaw, N. Y., field offices, G. A. Reutzel and R. K. Shivel, spreadmen.

Tennessee Gas Transmission Co.—120 miles, 24-in., under way, Hamburg to Hudson River; Bechtel Constructors, Inc.; Richfield Springs, N. Y., project office, R. L. Bowman and G. H. Homann, superintendents.

Texas Eastern Transmission Corp.—791 miles, 30-in., planned, Kosciusko, Miss., to Connellsville, Pa.

Texas Eastern Transmission Corp.—36 miles, 20-in., under way by 6-1-51, Connellsville, Penna., to Oakland Storage area; Mahoney Contracting Co.; Henry Mogg, superintendent.

Texas Eastern Transmission Corp.—163 miles, 30-in., under way, Kosciusko, Miss., to Florence, Ala.; Williams Bros.-Davis Co.; Kosciusko, Miss., field office, G. R. Hamilton, spreadman.

Texas Gas Transmission Corp.—35 miles, 12-in., authorized, Slaughters, Ky., to Evansville, Ind.

Texas Gas Transmission Corp.—189 miles, 26-in., proposed, Acadia Parish to connection with existing facilities in Morehouse Parish.

Texas Gas Transmission Corp.—195 miles, 26-in., proposed, Gulf Coast region to southwestern Louisiana.

Texas Gas Transmission Corp.—372 miles, 26-in., proposed, looping from Bastrop, La., to Hardinsburg, Ky.

Texas Gas Transmission Corp.—580 miles, 26-in., proposed, Louisiana and Kentucky.

Texas-Illinois Natural Gas Pipeline Co.—1,300 miles 30-in., under way, Corpus Christi area to Joliet, Ill.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 30-in., under way, Mississippi River to Effingham, Ill.; Midwestern Constructors, Inc., contractor of Schedule 11 M. T. Wilhite, superintendent; field office Du Quoin, Ill.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 30-in., under way, Effingham to Sibley, Ill., Midwestern Constructors, Inc., contractor of Schedule 12. Monticello, Ill., field office, Cliff Simmons, superintendent.

Texas-Illinois Natural Gas Pipeline Co.—92 miles, 30-in., under way, Sibley to Joliet, Ill.; Midwestern Constructors, Inc., contractor of Schedule 13. Morris, Ill., field office, Denver Franklin, superintendent.

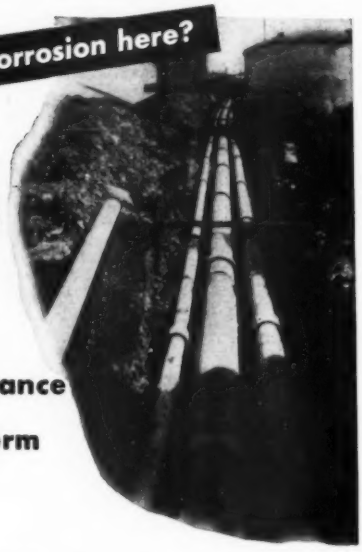
Texas-Illinois Gas Pipe Line Corp.—409 miles, 30-in., contracted, Arkansas and Missouri; Bechtel Corp. A. M. Berlander, general superintendent; field offices at Newport, Ark., J. E. Richardson; Texarkana Ark., V. L. Williams; Popular Bluff, Mo. A. M. Berlander.

Texas-Illinois Gas Pipe Line Corp.—200 miles, 30-in., contracted; Trinity River to Texarkana; H. C. Price, contractor. Work under way.

Transcontinental Gas Pipe Line Corp.—35 miles, 24-in., authorized, Paterson lateral to Greenwich, Conn.

Trunkline Gas Co.—1,775 miles, 10-26-in., under way, includes 740-mile, 26-in. Lake Charles, La., to Tuscola Station of Panhandle Eastern Pipe Line Co., and 1,035 miles, 10-24-in., Lake Charles, La., to McAllen, Tex., completion due October 1, 1952.

Trunkline Gas Co.—50 miles, 26-in., contracted, Longville to northeast vicinity of Hineston, La.; 126 miles, 26-in., contracted Epps to Hineston, La.; 42 miles, 16-20-in.,



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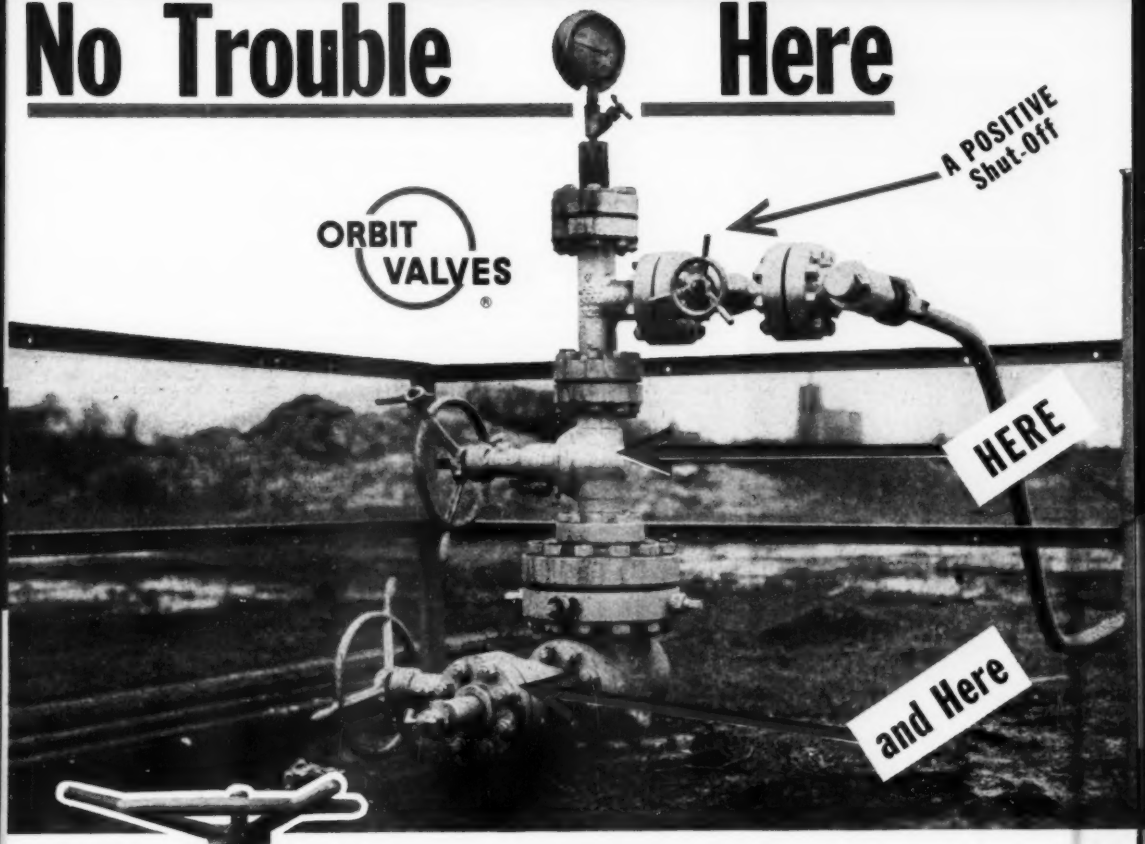

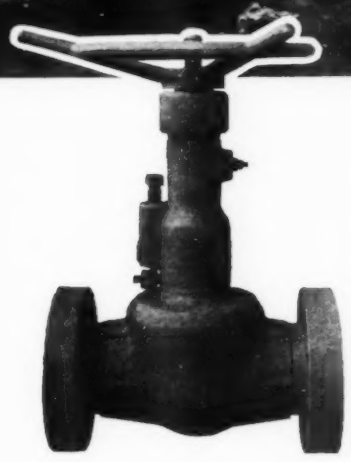

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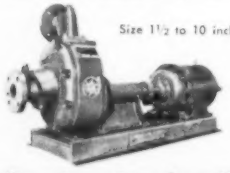

Size 1½ to 10 inch

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under way, Lake Arthur, Longville to point north of Iowa, La., (Section 1, lateral line); 13 miles, 20-in., under way, Lake Arthur, La., to Lacassine, La.; Houston Contracting Co., contractor.

Trunkline Gas Co.—176 miles, 26-in., under way, Darnell, La., to Longville, La.; Houston Contracting Co., contractor of Section A, main line. E. C. Norris, Olla, La., spreadman. W. H. Hayes, spreadman, De Ridder, La.

Trunkline Gas Co.—180 miles, 26-in., contracted, Darnell, La., to Senatobia, Miss.; Anderson Bros. Corp., contractor, Section B, main line.

Trunkline Gas Co.—184 miles, 26-in., under way, Senatobia, Miss. to Paducah, Ky.; R. H. Fulton & Co., contractor of Section C, main line. Clark Williams, Memphis, Tenn., spreadman.

Trunkline Gas Co.—186 miles, 26-in., contracted, Joppa to Tuscola, Ill.; Mahoney Contracting Co., contractor of Section D main line. Flora and Marion, Ill., field offices, Henry Mogg and Barney Finnerty, spreadmen.

Trunkline Gas Co.—262 miles, 20-in., contracted, McAllen to Altair, Tex.; R. H. Fulton & Co., contractor of Section E and F lateral lines.

Trunkline Gas Co.—217 miles, 24-in., contracted, Longville, La., to Altair, Tex.; Anderson Bros. Corp., contractor of Sections G and H, lateral line.

United Gas Pipe Line Co.—50 miles, proposed, southeastern Alabama and northwestern Florida.

United Gas Pipe Line Co.—93 miles, 6 to 16-in., under way, fields in Plaquemines Parish, Louisiana, to near New Orleans. H. C. Price, J. Ray McDermott, and Brown & Root, contractors.

United Gas Pipe Line Co.—100 miles, 20-24-26-in., contracted, Near Houma to Franklin, La.; Associated Pipe Line Contractors, Inc.

United Gas Pipe Line Corp.—510 miles, 24-26-30-in., contracted, Agua Dulce, Tex., to Monroe, La.; 233 miles, 20-24-26-30-in., from Pure Oil Co.'s offshore platform Block 32 Eugene Island area to Jackson, Miss., comp. sta.; 42 miles, 24-in., from Verna comp. sta., Miss., to Baxterville, Miss., dehydration plant; 52 miles, 20-24-26-in., Lirette to Napoleonville, La. to tie into Eugene Island-Jackson, Miss. 30-in. line mentioned above; 60 miles, 12-16-20-in., from Lafayette comp. sta. and Weeks Island field to Franklin, La., to connect with above mentioned 30-in.; 59 miles, 30-in., Jackson comp. sta., Miss., to Texas Eastern Trans. Corp. proposed 30-in. line near Kosciusko, Miss.; 124 miles, Sterlington comp. sta. near Monroe, La., to Jackson comp. sta., Miss.; 23 miles, 8-12-16-in., South Louisiana facilities; all contracted by Gulf Southern Contractors, a joint venture including Texas Louisiana Contractors; Oklahoma Contracting Co.; J. Ray McDermott and Morrison-Knudson. Inspection by Brown & Root, Inc.

U. S. Army Engineers.—190 miles, 6⅝-in., under way, Searsport to Limestone, Me.; Associated Pipe Line Contractors, Inc. Completion date 10-15-51.

Utah Natural Gas Co.—360 miles, 22-in., proposed, San Juan Basin area to Salt Lake Utah.

Valley Gas Pipe Line Co., Inc.—500 miles, 24-in., proposed, Berclair, Goliad County, to northeast Saratoga, Hardin County, Texas, to Vermilion Bay area of Louisiana.

Valley Gas Pipe Line Co., Inc.—1,000 miles, 30-in., proposed, Saratoga northeast to Arcadia, La., to El Dorado and Jonesboro, Ark., Cape Girardeau, Mo., Lawrenceville, Ill., Terre Haute, Ind., and Atlanta, Ind., thence to northeast terminal point in southern Michigan.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Westcoast Transmission Co., Ltd.—1,408 miles, 30-in., planned, northern Alberta to Vancouver, B. C., and northern California.

Western Kentucky Gas Co.—2 to 4-in., under way, additions to present system; Modern Welding Co., Inc., contractor.

Western Pipe Lines.—1,200 miles, 22-in., planned, Southern Alberta to Duluth, Minn.

York Gas Co. and Corning Glass Co.—30 miles, York, Pa., and Corning, N. Y.; Britton Contracting.

Foreign Crude-Oil Pipe Lines—Planned and Under Way

Alberta Pacific Oil Pipe Line Co. (Brokaw, Dixon, McKee).—970 miles, 16-in. proposed, Edmonton south to Kingsgate, B. C., to Washington to Vancouver, B. C.

Basrah Petroleum Co.—72 miles, 12-16-in., under way, Zubair to Fao, Iraq.

Cia. de Petroleo Ganso Azul, Ltd.—48 miles, 4-in., planned, Ganso Azul field to Pucalpa on upper Ucayali River, Peru.

Condor S.P.A. (Shell).—80 miles, planned, Genoa to Rho, near Milan, Italy.

Direccion General de Yacimientos Petroliferos Fiscales.—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

Iraq Petroleum Co., Ltd.—556 miles, 30-32-in., under way, Kirkuk, Iraq, to Banias, Syria, 1952; Bechtel-Kirkuk, contractor.

Middle East Pipelines, Ltd.—800 miles, 34-36-in., planned, Iran to a Levantine port.

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NATURAL GAS

Oakford Beginning

Field work starts on big gas-storage project

FIELD work was started last week for construction of a $13,700,000 underground natural-gas-storage project in the Oakford area near Jeannette, Pa., about 20 miles east of Pittsburgh. Grading work is under way for construction of a $7,500,000 compressor station for the project.

The field will be developed over a period of 5 years by New York State Natural Gas Corp., a subsidiary of Consolidated Natural Gas Co., as a joint operation with the Texas Eastern Transmission Corp. New York Natural will spend a total of $6,850,000 for one-half of the cost of plant facilities, $3,700,000 in 1951. Each firm will pay one-half of operating expenses, and each will own one-half of the gas in storage.

Capacity breakdown. — Of the total capacity of Oakford field, estimated at 105 billion cubic feet, 45 billion will be handled as a permanent inventory or "cushion" to maintain sufficient pressures in the field for efficient storage operations. The balance of 60 billion will be stored and withdrawn each year.

Deliveries will be available in increasing volumes each year during the development period. When full capacity has been reached, operating plans call for the delivery of 400 million cubic feet a day during the heating period from November through March—deliveries to be split evenly between New York Natural and Texas Eastern.

Other projects.—Approximately $10,000,000 will be spent during 1951 by New York Natural for construction of two other important new storage fields, the South Bend and Sabinsville, Pa., projects.

The South Bend project, located 45 miles northeast of Pittsburgh, now under construction, is expected to furnish up to 260 million cubic feet per day. This volume will be available for peak-load supply at the beginning of the 1951 heating season.

The Sabinsville field in Armstrong and Indiana counties, will be used in conjunction with the company's other storage fields to store and withdraw gas received from Tennessee Gas Transmission Co. as a supply for the new Utica-Albany system.

Hugoton Gas Curbs Eased

WICHITA. — The Kansas Corporation Commission relaxed its proration rules for Hugoton field last week to allow Hugoton Production Co. to reopen 49 gas wells previously shut in because they were overproduced.

The order was aimed to avoid future gas shortages experienced by customers of Kansas Power & Light Co. which purchases the entire output of Hugoton Production. Kansas Power & Light supplies gas to 90 cities in Kansas and wholesales to another firm serving 15.

Depletion of the utility's own gas fields and its failure to find more sources prior to 1950 forced rigid curtailment in severe weather.

Hugoton Production Co. has reported a slowup in its development program due to difficulty encountered in obtaining small-diameter pipe.

New York Areas Converting

NEW YORK.—Preparations by the big New York utilities for converting their systems to handle straight natural gas are going ahead.

Consolidated Edison Co. was authorized by the New York Public Service Commission last week to proceed with its conversion in Westchester County and in portions of the Bronx and Queens. The changeover, which will affect 207,500 customers, is scheduled for completion in September.

The commission said the company had proposed rate reductions after the changeover, but said that they were not acceptable and that public hearings would be held before completion of the project to determine new rates.

Mixed gas now supplied by the company has a heat content of about 537 B.t.u. per cubic foot, while natural gas generally has a content of not less than 1,000. Mixed-gas appliances cannot operate on straight natural gas, and consequently every appliance affected by the conversion will necessarily have to be adjusted.

Brooklyn Union Gas Co. has announced that it will spend about $18,000,000 to convert its 850,000 customers to the natural product. However, until next spring the company will continue to use mixed gas with the same heating value as the manufactured gas used up to last January, when natural gas was introduced into the area.

Texas Approves Gas Study

AUSTIN.—A plan for an interstate study of natural-gas problems received legislative approval in Texas last week.

The house adopted the senate resolution requesting Gov. Allan Shivers to appoint five Texans to meet with similar committees from Oklahoma and Kansas.

The move was sponsored by Gov. Johnston Murray of Oklahoma and Gov. Edward F. Arn of Kansas in an effort to obtain joint action from producing states, particularly on regulation of natural-gas production and shipment to other areas.

Gas-Price Fixing Opposed

BARTLESVILLE.—William J. Murray, Jr., a Texas Railroad Commission member, came out against any assumption by the commission or any other agency of natural-gas price-regulating powers in his testimony here during Federal Power Commission hearings on the Phillips Petroleum Co. case last week.

Murray said that he was opposed to fixing either maximum or minimum prices at the well, and said a proper level would be found through competition between buyers and producers, as well as between different fuels.

The price of gas in Texas directly affects conservation of gas there, and regulation of prices either up or down would influence the Texas Railroad Commission's conservation efforts adversely, he said.

Murray said that there had been reluctance on the part of many gas producers in Texas to sell to an interstate pipe-line company for fear that FPC would interfere and regulate prices. If FPC should step in, sales to these companies would be restricted and gas conservation would be disrupted accordingly.

Meanwhile, Gov. Walter Kohler of Wisconsin, who was expected to testify before the hearing, had not yet arrived.

Natural Gasoline

Phillips Plans Texas Plant

BARTLESVILLE.—A new natural-gasoline plant to serve the Tex Harvey, Germania, and Driver areas of Midland and Glasscock counties will be constructed soon by Phillips Petroleum Co.

Part of the gas processed will come from Phillips' own production in these fields and the remainder from operators with whom contracts have already been negotiated. Gas production from more than 26,000 acres now under development is either owned or contracted to the plant.

A crude outlet for this same general area was announced by Phillips recently *(The Oil and Gas Journal, April 19, page 249)*.

Installation designing is well under way, and it is planned to break ground soon. The company is now engaged in securing pipe-line rights-of-way before starting construction of the plant. The installation will be known as Spraberry plant.

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Among the Drilling Contractors

Coats Takes Contracts For Three Texas Tests

Coats Drilling Co., Longview, Tex., has contracted for three additional wildcat tests to be drilled in eastern Texas. One of these tests, contracted for 8,500 ft., will be drilled for W. M. Coats, one of the owners of the contracting company, in the Preston Bland Survey, 6 miles northeast of Omaha, in Morris County. Both of the other two, contracted for 5,800 ft. each, will be drilled for P. N. Wiggins, Jr., and C. E. Hyde. The first to be drilled is located in the W. T. Jenkins Survey, 5 miles east of Athens, in Henderson County. Location for the other is in the Samuel Chears Survey, 6 miles southeast of Athens.

Santa Fe Is Contractor On Pool Discovery Well

Santa Fe Drilling Co., Santa Fe Springs, Calif., has added another oil discovery to the list of wells it has drilled. It was the contractor on Seaboard Oil Co.'s wildcat test in the Cuyama Valley, Santa Barbara County, California, which was completed recently as a pumping well from a sand around 7,300 ft. The new producer, 78 - 22 Seaboard - Richfield-Kirschenmann, located in 22-10n-26w, has been listed as the discovery well of the Central Cuyama field. It is about 3½ miles northeast of the South Cuyama field.

Tiger Drilling Co., Oklahoma City, is starting another well for Ashland Oil & Refining Co. in the North Marshall pool in Logan County, Oklahoma. Latest operation is 1 Roy Baker, NW NW NE 9-19n-4w.

Dorris Ballew, Inc., Natchez, Miss., has the contract for a wildcat test which Humble Oil & Refining Co. is starting in the area 2 miles northwest of Pine Ridge, in Adams County, Mississippi. Location for the test, 1-B Yunkin, is in 7-8n-3w.

Colorado-Wyoming Drilling Co. is the contractor on a Dakota series wildcat test to be drilled by R. W. Holt and Eddie Fisher of Denver in the area about 7 miles west of Fort Morgan, in Morgan County, Colorado. Location is in the SE NE 11-3n-59w.

Thompson Drilling Co., Cushing, Okla., is moving in for another well to be drilled for Republic Natural Gas Co. on the north side of the Ingalls pool, in Payne County, Oklahoma, where activity is being revived following recent completion of a Misener-Hunton well. The new Republic operation is 2 Vogt, located in the NE SW SW 22-19n-4e.

Nowery Drilling Co., Shreveport, has a rig working for Stanolind Oil & Gas Co. on a Sligo exploratory well on the latter's Haynes unit, Webster Parish, North Louisiana. Location is in 1-23n-10w.

Kerr - McGee Oil Industries, Inc., Oklahoma City, is starting its third well for Stanolind Oil & Gas Co. in the latter company's newly opened field in Banner County, Nebraska. The new operation, 2 Downer, C SW NE 6-18n-55w, is ½ mile northwest of the discovery well.

O'Rourke-Baker Drilling Co., Tulsa, has a contract with Eason Oil Co. for a wildcat test to be drilled at the west edge of the Harrah townsite in Oklahoma County, Oklahoma. The test is 1 Horse Shoe, with location in the NW NW NE 26-12n-1e. It is 5 miles southeast of the Jones pool, nearest production.

Glasscock Drilling Co., Shreveport, has moved a heavy rotary rig to a wildcat location 4 miles south of Buckner, Lafayette County, Arkansas, where it has a contract for an 8,400-ft. Smackover lime test to be drilled for E. G. Bradham. Location is for 1 Burton Brothers, C SE SW 2-17s-23w.

Viersen & Cochran, Okmulgee, Okla., will drill a 5,300-ft. test for British-American Producing Co. at 1 Spencer, NW NW NW 20-9n-4e, southeast of Tecumseh, Pottawatomie County, Oklahoma. It is ¾ mile west of the abandoned Tecumseh pool.

Lewis & Mucher Drilling Corp. is completing its seventh well for Phillips Petroleum Co. in the East Watchorn pool, located on the Osage-Pawnee county line, in Oklahoma, and is preparing to move to its eighth location. Earl Ingram, Jr., part owner of the company, is Oklahoma manager, and T. R. Starbuck, drilling superintendent.

L. B. Jackson, Tulsa, has a contract for a 6,000-ft. geological test to be drilled for Tide Water Associated Oil Co. in the Sholem Alechem field, Carter County, Oklahoma. The projected depth is well below the present producing zones of the field. Lo-

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cation is for 1 Morgan, SW SW NW 28-1s-3w.

N. & R. Drilling Co., Holdenville, Okla., has a rig working on a projected 3,900-ft. wildcat test being drilled for Clark C. and J. Marshall of Oklahoma City at 1 Dalluege, SW SW NW 18-17n-5e, southwest of Cushing, Payne County, Oklahoma. Location is about 2½ miles southwest of production in the March pool.

Lyle Cashion, Inc., Jackson, Miss., has the contract for and an interest with Ralph Stanley and associates in a Eutaw sand wildcat test to be drilled 2 miles north of the Yellow Creek field, in Wayne County, Mississippi. Location is in the NE NE NE 36-10n-8w. Objective is expected around 5,500 ft.

N & R Drilling Co., Holdenville, Okla., has moved a rig to a wildcat location about 5 miles east of Sparks, Lincoln County, Oklahoma, where it will drill a Prue sand test for Clark C. and J. Marshall Nye. The location, on the Gaston lease in the SE SE NW 1-13n-5e, is about 2½ miles east of production in the East Sparks pool.

Mora Drilling Co., Tulsa, has a rig working on a shallow hole which Sunray Oil Corp. is drilling at 1 Leverett, SE NE SE 18-16n-10e, a mile east of production in the Bristow district, Creek County.

Pioneer Drilling Co., Casper, Wyo., has the contract for a deep test which Shell Oil Co. has projected for its Bluff unit, located in the NW NW NE 32-39s-23e, southwest of the Monticello area, in the San Juan Basin, southeastern Utah.

Parker Drilling Co., Tulsa, has a contract with United Carbon Co. for a projected 11,000-ft. semiwildcat test to be drilled in western Washita County, Oklahoma. The location, on the Z. Music lease in the C NW SE 28-10n-20w, is about ½ mile southeast of the most southeasterly well of the Elk City field.

ROTARY RIGS IN OPERATION*

(United States and Western Canada)

Area—	Week ended 5-7-51	Change week ended 4-30-51	Change week ended 5-8-50
Gulf Coast	548	+15	+ 57
W. Tex.-N. M.	854	+12	+125
Ark.-N. La.-E. Tex.	146	+ 4	+ 11
Oklahoma	296	—13	+ 29
Kansas-S. Nebraska	154	— 3	+ 24
Illinois-Eastern	132	+ 6	+ 6
Rocky Mountains	129	+10	+ 58
Pacific Coast	143	— 7	+ 20
Total U. S.	2,402	+24	+330
Western Canada	707	— 8	+ 50
Total	2,509	+16	+380

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States as a whole and the Rocky Mountains and western Canada areas are shown by charts on pages 180 and 181.

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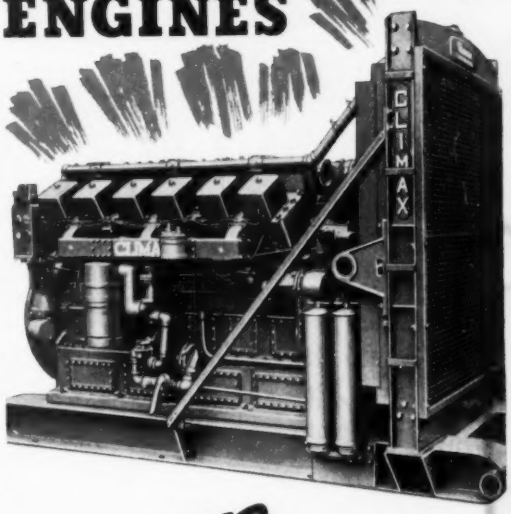

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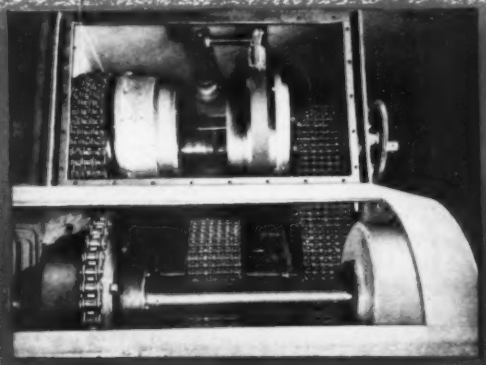
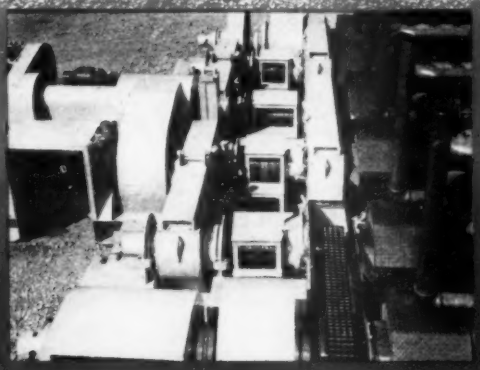


At left: Typical Diamond Roller Chain applications on drilling rig transmission.

At right: Compound Diamond Roller Chain Drives are extensively used on leading makes of drilling and servicing machinery.



Midland Basin's Spraberry

HARDLY had the "reef play" of the Scurry County area begun to taper off than the potentialities of the Spraberry sandstones of the Midland basin just to the southwest began to be generally recognized. Leasing and royalty buying in the Spraberry area has reached proportions comparable to the reef play back in 1949 and the first half of 1950.

1. Where are these Spraberry sandstones? 2. What are they like? 3. How much oil recoverable by current producing methods do they contain?

The accompanying sketch map indicates the areal extent of these sandstones. They do not outcrop but have been found throughout most of the Midland basin from the western edge of the Eastern platform to the eastern edge of a narrow belt roughly paralleling the Central Basin platform.

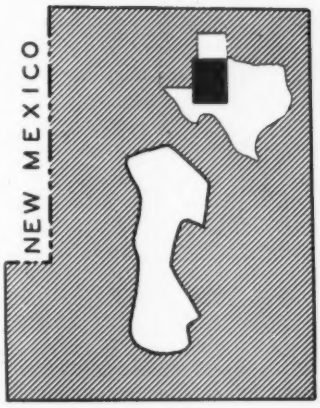
They are found at depths running from approximately —2,500 ft. subsea on the east to over —5,000 ft. subsea on the west from surface elevations of 2,500-3,000 ft.

In the geologic column these sands are placed in the Permian-lower Leonard, but are believed to represent a lithologic unit rather than a time unit.

The sandstones do not vary greatly throughout the area except that they grow progressively more silty from the north to the south.

At the type locality (Seaboard Oil Co. of Delaware 6-D Spraberry in Spraberry-Deep field in eastern Dawson County) the section as described by Lamar McLennan, Jr., and H. Waring Bradley of Midland, consists of an upper sand member about 300 ft. thick and a lower sand member of about the same thickness. The two zones are separated by approximately 250 ft. of shaly, gray to brown limestone and streaks of brown calcareous shale carrying thin sand stringers which merge with the main sands in areas of maximum sand development.

Both the upper and lower sand members have essentially the same lithologic characteristics. They are gray, very fine-grained, relatively clean sandstones with thin streaks of limestones and dark gray to black shale. Toward the edges of this big "lens" the sand bodies grade into



shale (south and west) or limestone and shale (north and east).

The answers to the first two questions meet with general agreement as they have specific data to back them up. However, the answer to "what are these sandstones going to yield?" is still in the state of confusion. The development of these Spraberry sandstones is too recent to have production history be of much help in answering this question. Core analysis isn't worth much either because though the sands are tight (permeability is normally below 2 md. and can't even be measured in some cases), they are highly fractured with vertical communication sufficiently developed to permit cement to be forced as much as 50-70 ft. below the bottom of the hole when cementing pipe at or near the top of the Spraberry.

Within that white spot on the map there are about 6,000 sq. miles of real estate and many geologists believe that at least 500,000 acres of that area will some day be producing. You don't need very high recoveries to come out with a figure of 2,500,000,000 bbl. of oil when you have that much productive area, but the great number of wells required to get this oil is the other side of the story.

One point on which everyone agrees is that the over-all potential of the Spraberry sandstones is great—that the area will some day have a concentration of producing areas comparable to northeastern Oklahoma or the Central Kansas uplift. It's the economics of that development that is still the big question.

Philip C. Ingalls.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

ROCKY MOUNTAIN REGION.—Carter Oil Co.-Stanolind Oil & Gas Co. plugged the Blue Bell, Uintah County, Utah, wildcat, but new locations were staked by Carter, Phillips Petroleum Co., Sun Oil Co., and others in this basin. A. K. Wilson of Salt Lake City found oil in the Moenkopi at a shallow test in the Iron Wash area, Emery County, Utah. Two new discoveries are near completion in the current Denver-Julesburg Basin play, South Texas Development Co.'s Morgan County test, and Orin Tucker's Adams County venture. (See field report for details.)

WEST TEXAS.—General Crude Oil Co. 1-6 Jones, southwest offset to Kewanee Oil Co. 1 Oliver, recent Kent County discovery or major extension in the Salt Creek area, has apparently established the reef trend around the new well. It found the Canyon reef at 6,275 ft., minus 4,126 ft. Field sources placed this top 117 ft. high to the 1 Oliver. It was drilling ahead with no tests reported.

CANADA.—A wildcat which had found both Viking sand gas and Lower Cretaceous oil production has now discovered D2 Devonian oil. Texaco Exploration Co. and McColl-Frontenac Oil Co., Ltd.-Wizard Lake 2 recovered 1,600 ft. of oil on the latest test at 5,728-38 ft. Located in LSD 12, 22-48-27w4, the well is heading for the D3 zone.

Southwest Texas

Atascosa County Gets Second Edwards Producer

CORPUS CHRISTI—Lone Star Production Co. 2 Sarah E. Ferry, second oil producer from the Edwards lime in the Coughran area of Atascosa County, has been completed flowing 132.62 bbl. of 37.9°-gravity oil per day, through 3/16-in. choke. Top of the Edwards was logged at 8,136 ft., and total depth was 8,220 ft. Production is from perforations between 8,158-78 ft. with 64 shots. Well is ½ mile southwest of the discovery, and is in Manual Leal, Jr., Survey 1699½, A-1496.

Superior Oil Co. has filed notice of intention to deepen its 27 Minnie S. Welder, deep test in Portilla field, San Patricio County, to record depth of 20,000 ft. Operation, if successfully carried out, will create a new drilling depth record for this sector of the country. Operator has drilled to total depth 13,785 ft. and cemented 9⅝-in. protective string at 9,090 ft. Well is 5 miles northeast of Sinton in Section 24 of Welder Ranch Subdivision.

La Gloria Corp. 1 Ray & Harvey, northeast extension at Harvey field, San Patricio County, has been completed for 124 bbl. of 42°-gravity oil per day, flowing through ⅛-in. choke from perforations at 8,716-34 ft., a new pay zone. Crossover packer has been set to allow production through tubing from this zone and casing production of gas from lower perforations at 8,884-8,906 ft. Total depth is 10,120 ft. with casing set at 9,465 ft. Well is in Section 63, Fifth Addition to Taft farm lands.

Kirkwood & Morgan, Inc., 1 O. S. Petty, wildcat in Atascosa County School Land Survey 298, A-704, in southwestern La Salle County, is plugged back to around 3,000 ft. and operator is sidetracking to redrill and core. Tests will be made of the sand which indicated good shows at 3,370-75 ft. on electrical survey and side-wall samples. Hole is bottomed at 5,310 ft. and plugged back to 3,375 ft. for drill-stem test of the section.

Howeth & Mason are completing a small oil producer, 1 George Light, wildcat in southeastern Dimmitt County. Casing was perforated at 5,812-42 ft. with 120 shots and operator swabbed in. Well is flowing to pits to clean. Testing will get under way after erection of storage. Although production is expected to be small, operators are sure of a commercial producer. Total depth is 6,005 ft. with oil string cemented on bottom. Location is in I&GN RR Survey 67, Block A, A-529.

Phillips Petroleum Co. has set casing in 9 Copana Bay State Tract 67, at 7,843 ft., and is preparing to perforate for production tests. Hole is bottomed at 8,050, and electric log was run to confirm sands cored in the well. Best interval was from 6,630-6,800 ft., where the well is credited with about 130 ft. of good sand with oil shows.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Aransas County: Gas-distillate—Union Producing Co. 4 Virginia H. Tatton, John M. Shreve Sur., A-186, TD 10,490 ft., perf. 8,701-21 and 9,736-63 ft., IP: 700,000 cu. ft. gas and ½ bbl. distillate through ¼-in. choke.

Nueces County: Gas discovery—C. G. Glasscock 1 Thomas Dix, Block 2, Banks Subd. of Driscoll Ranch, TD 7,502 ft., perf. 6,550-58 ft., IP: 28,000,000 cu. ft. gas per day open flow (5,130,000 cu. ft. per day on 5/16-in. choke).

San Patricio County: New pay, oil, in Midway field—F. M. Boykin, Jr., A-1 A. W. Scrivner, Section "J" of G. H. Paul Subd., Coleman-Fulton Pasture Co. Lands, TD 8,702 ft., perf. 6,615-16 ft., IP: 76 bbl. oil per day on ⅛-in. choke, TP 1,025 psi., CP 2,175 psi. 41° gravity.

New pay, oil and gas dual completion in Harvey field—La Gloria Corp. 1 Ray & Harvey, Lot 8, Block 63, 5th add. to Taft Farm lands, TD 10,120 ft., PB 9,465 ft., perf. 8,716-34 ft., IP: 124 bbl. oil per day, ⅛-in. choke, TP 1,050 psi., 42.5° gravity, perf. lower zone 8,884-8,906 ft., IP: flowed dry gas, no gage.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Rantex Oil Co. 17 Manuel Yturria, Jose Santa de la Garza Grant, dry, TD 970 ft.

Brooks County: Chicago Corp. 1 Boedeker Ranch, CCSD&RGNG Sur. 7, A-126, dry, TD 5,080 ft.

Caldwell County: Orion Oil Co. 1 Joe Rochelle, Michael Gillian Sur., A-19, dry, TD 1,980 ft.

Duval County: Delhi Oil Corp. 1 J. R. Foster Heirs, Chas. Adami Sur. 206, dry, TD 8,898 ft.

Kirkwood & Co., Coffield & Ranger 1 Thomasa Saenz, J. J. M. de la Garza Falcon Grant, A-216, dry, TD 6,115 ft.

Tiger Minerals, Inc., 1 S. E. Harville, L. Keithley Sur. 46, A-1,659, dry, TD 2,616 ft.

Frio County: F. William Carr 1 W. F. Smith, Jos. Schorp Sur. 28, dry, TD 6,310 ft.

Jim Hogg County: Dulaney Oil Co. and Geo. Buck 2 Mrs. Rosa Palacios, S. C. Hendrix Sur. 291, dry, TD 3,150 ft.

O. W. Killam 1 M. A. Yeager, Sur. 103, dry, TD 3,317 ft.

Jim Wells County: Progress Petroleum Co. of Texas 1 H. T. Sain, Lancock, Loving & Roby Subd. of Los Presenso de Arriba Grant, A-148, dry, TD 5,150 ft.

H. R. Smith & Thos. E. Berry et al 2 Mrs. W. W. West, Jose de la Garza Montemayer Sur., dry, TD 5,659 ft.

Webb County: Seaboard Oil Co. of Delaware 1 La Mesa Land & Cattle Co., C. C. Thomas Sur., A-2,708, dry, TD 4,017 ft.

The Texas Co. 2 Frost National Bank, T. Guerra Sur. 462, A-2,104, dry, TD 2,508 ft.

Zapata County: Chicago Corp. 1 Chas. Schroeder, J. T. Lane Survey 311, dry, TD 3,355 ft.

Kansas

Western Kansas County Opens First Production

GOVE County, in far western Kansas, where oil pools are few and far between, is getting its first production. Cities Service Oil Co. 1 Coberly, NW SE SE 15-14-29, located a few miles southwest of Gove, the county seat, pumped 130 bbl. of net oil with 19 bbl. of water in 8 hours during an initial production test. During the last 3 hours of the test, production was at the rate of 14 bbl. of oil and ½ bbl. of water per hour. Pay zone is the Marmaton lime (Pennsylvanian), opposite which casing, run to 4,629 ft., is perforated at 4,304-10 ft.

Nearest other production is in the small Arnold pool, 28 miles to the southeast in Ness County. Drilled to 4,644 ft. in Arbuckle lime, topped at 4,610 ft. (—1,969 ft.), the well found no other showings of consequence outside the present producing zone. With a surface elevation of 2,641 ft., the well had the Lansing at 3,754 ft., the Mississippian at 4,393 ft., the Viola at 4,554 ft., and the Arbuckle at 4,610 ft.

Testing also is under way at another far western Kansas wildcat, Willis L. Hartman 1 Damme, SE SE NW 21-22-33, Finney County, the second county to the south of Gove. The well, located 3 miles east of the north end of the Hugoton gas area and 7 miles southeast of the Nunn pool, nearest production, is a prospective producer in both the Pennsylvanian Marmaton, topped at 4,300 ft. (—1,404 ft.) and the Mississippian, topped at 4,637 ft. (—1,741 ft.). Total depth is 4,805 ft. with casing at 4,782 ft.

Testing Mississippian below the casing, the well swabbed water. From casing perforations at 4,764-74 ft., it swabbed 45 bbl. of fluid, 25 per cent oil, per hour after acidizing with 500 gal. From perforations at 4,711-19 ft. with plug at 4,750 ft. and pay treated with 500 gal. of acid, it swabbed 50 bbl. of fluid, 25 per cent oil, per hour. Plugged to 4,740 ft., it swabbed 15 bbl. of oil per hour for 6 hours. Marmaton remains to be tested.

Columbian Fuel Corp. and United Producing Co. 1 Novinger, C NW NW 26-33-30, southwestern Meade County, in the southwestern part of the state, completed last month as a small discovery well in the Mississippian, has been plugged back to the Pennsylvanian Marmaton, and from casing perforations at 5,270-90 ft. flowed 800 bbl. in 8 hours. Mississippian production was from perforations at 5,803-32 ft., where the well pumped 66 bbl. per day on potential tests. Total depth is 6,638 ft. with casing at 5,904 ft. This discovery is 15 miles east of Hugoton gas production.

Petroleum, Inc., and Dooley Engineering Co. 1 Bayer, SE SE SE 16-21-14, a mile northwest of the VanWinkle pool, in Stafford County, swabbed from 12 to 15 bbl. of net oil per hour while testing its prospective Lansing-Kansas City pay zone, opposite which casing is perforated at 3,560-64 ft. Previously, the well swabbed 1 bbl. of oil and 3 bbl. of water per hour from Arbuckle lime, perforated at 3,747-48 ft. Tops are: Lansing-Kansas City, 3,394 ft. (—1,455 ft.); Arbuckle, 3,742 ft. (—1,803 ft.).

Derby Oil Co. is opening a new producing spot in Rooks County at its 1-A Rogers, SW SW SW 22-10-20, which swabbed 7 bbl. of oil per hour for 10 hours while testing Arbuckle. Total depth is 3,726 ft. with top of the pay at 3,719 ft. (—1,577 ft.). The well is only ½ mile southwest of the Marcotte pool but is separated from that pool by dry holes.

KANSAS SUCCESSFUL WILDCATS

Ellis County: Brooks Pierce 1 Vine, NW NW SW 23-11s-19w, pumped 906 bbl. oil from Arbuckle at 3,534-43 ft., TD; Heebner 3,183 ft., Lansing-Kansas City 3,225 ft., Sooy 3,480 ft., Simpson 3,507 ft.

Sterling et al 1 Karlin, NW SW NE 14-13s-17w, pumped 77 bbl. oil from Lansing-Kansas City 3,348-52 ft., TD 3,568 ft., anhydrite 1,185 ft., Topeka 2,985 ft., Heebner 3,231 ft., Arbuckle 3,529 ft.

Saline County: L. Phillips-Sanderson 1 Ryding, NW NW NW 1-16s-4w, 508 bbl. oil from Viola at 3,439-43 ft., TD; Mississippi lime 2,916 ft., Kinderhook 3,200 ft., shaly sand 3,338 ft., Hunton 3,359 ft., Maquoketa shale 3,367 ft.

Sumner County: Ellis & Berry 1 Lee, SE SE NE 33-32s-2e, pumped 25 bbl. oil from Mississippi chert at 3,350-59 ft., TD; Layton 2,780 ft., Kansas City 2,829 ft.

Woodson County: Ashlock et al 1 Schlenger, SW SW SW 30-23s-15e, 20 bbl. oil from 1,618-31 ft., TD; Mississippi lime 1,592 ft.

KANSAS WILDCAT FAILURES

Barton County: Bergman 1 Schneweiss, SW SW SE 32-16s-12w, dry, TD 3,405 ft.

Nadel & Gussman 1 Lewis, NW NW SE 3-16s-13w, dry, TD 3,410 ft.

GMR 1 Baker, NW NW SW 16-17s-13w, dry, TD 3,452 ft.

Butler County: Gaty 1 Mauck, SW NW SE 6-25s-3e, dry, TD 3,178 ft.

Adair-Wixson 1 Noble, SE SE SE 7-26s-4e, dry, TD 3,053 ft.

Carlock 1 Lichlyter, NE NE NW 11-27s-4e, dry, TD 2,720 ft.

Clark County: Northern Natural 1 McCausland, C NW SW 20-30s-21w, dry, TD 7,164 ft., Herrington 2,660 ft., Krider 2,720 ft., Gage 2,860 ft., upper Ft. Riley 2,890 ft., Topeka 3,640 ft., Lansing-Kansas City 4,520 ft., Mississippi lime 5,242 ft., Simpson shale 6,240 ft., Arbuckle 6,368 ft.

Ellis County: Pierce & Kiowa 1 Gross, NW NW NW 29-14s-17w, dry, TD 3,573 ft.

Transit 1 Werth, SW SW SW 29-15s-18w, dry, TD 3,576 ft.

Graham County: Yockley 1 Blazier, SE SE NE 34-9s-21w, dry, TD 3,902 ft.

Jones-Shelburne & Farmer 1 Holmes, SW SW NE 28-10s-21w, dry, TD 3,884 ft.

Pawnee County: Stanolind Oil & Gas Co. 1 Boyd, NE NE SW 9-21s-17w, dry, TD 3,997 ft.

Phillips County: Imperial and Bay 1 Allen, SE NE NW 27-1s-17w, dry, TD 4,015 ft. Yockley 1 Shaw, NE SW NE 28-4s-20w, dry, TD 3,520 ft.

Rooks County: Herndon 1 Schindler "B," SW SW NE 17-8s-17w, dry, TD 3,473 ft. Cook-Galloway et al 1 Smith, NW NW NW 26-10s-19w, dry, TD 3,718 ft.

Rush County: Brack 1 Mausolf, NW NW NE 23-19s-16w, dry, TD 3,758 ft.

Saline County: Harper 1 Bachofer, NE NE NE 15-15s-2w, dry, TD 2,807 ft.

Oklahoma

Atlantic Test Opens McClain County Pool

A NEW pool, producing from the basal Pennsylvanian lime zone, has been opened in southeastern McClain County. Discovery well is Atlantic Refining Co. 1 Newbern, SE SE NW 22-5n-2e, about 2 miles northwest of Byars. Its pay zone is open through casing perforations at 4,290-4,302 ft. Initially, before acidization, the well produced at an average rate of 3.65 bbl. of oil per hour with flow restricted to 30/64-in. choke. Later, after 500 gal. of acid had been applied to the formation, the well produced 117.6 bbl. of oil during a period of 8 hours through 16/64-in. choke. Gas-oil ratio was 1,318 cu. ft. per barrel. Gravity of the oil was 41°.

The well had been drilled to a total depth of 5,790 ft., penetrating the lower Ordovician sands with no showings of commercial potentialities below the present horizon. Casing was run to 4,476 ft. Nearest other production is the West Johnsonville pool, about 2 miles to the east, where there is a lone well in the Viola.

Finston & Co. appears to have a good Bartlesville sand discovery 2½ miles west of the Northwest Tyron pool, in Lincoln County, where its 1 Dumas, NE NE NE 6-16n-3e, flowed at an estimated rate of 50 bbl. of clean oil per hour and more than 4,000,000 cu. ft. of gas per day during a drill-stem test. Bottom-hole flowing pressure was 500 psi. When the well was shut in, pressure built up to 1,800 psi. Recovery in the breakdown was approximately 500 ft. of 41°-gravity oil. Top of the Bartlesville is 4,246 ft. Test was made with bottom of the hole at 4,260 ft. Casing was run 2 ft. in the pay to 4,248 ft. The Northwest Tryon pool produces from the Red Fork sand, which failed to show commercially in the Finston well.

Prue sand production has been established at another step-out location in the West Davenport pool area in Lincoln County. Thompson & Harris 1 Gibbons, NW NE SW 17-14n-5e, about ¾ mile southeast of the pool, flowed at the rate of 25 bbl. per hour through 1-in. choke and 9 to 15 bbl. per hour through ½-in. choke in initial production tests of the newly opened pay zone. Production of the West Davenport pool is from Wilcox sand.

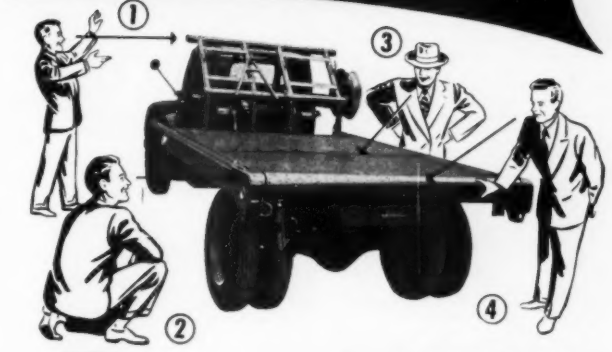
The new well is the second in the area to complete in the Prue sand, which, in this well, was logged at 3,556-66 ft. It is about 1½ miles northeast of the Prue sand discovery well completed about 2 weeks ago by Republic Natural Gas Co. That well, 1 Stewart, NE NE SW 19-14n-5e, located about a mile south of the West Davenport pool, topped the pay at 3,593 ft.

Another potential pay zone, the third, has been found by Shell Oil Co. in its 1 Tugman, NE SW NE 11-2n-8w, a wildcat located 2 miles west of Marlow in northwestern Stephens County Following a 60-minute drill-stem test of this zone at 7,593-7,606 ft., operators recovered 270 ft. of clean oil and 30 ft. of mud-cut oil. Other zones tested, all in the Pennsylvanian, were at 6,073-6,143 ft. and 6,629-74 ft. Both resulted in good oil flows.

OKLAHOMA SUCCESSFUL WILDCATS

Beaver County: Huber 1 Wallace, C SW NW 15-6n-21ecm, flowed 12,552,000 cu. ft. gas

CONSTRUCTION



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Creek County: Pickett and Chiles 1 Beaver, NW NE NE 12-17n-8e, flowed 2,500,000 cu. ft. gas from Skinner at 2,340-60 ft., TD 2,380 ft.

Kay County: Witter 1 Widener, SE NW NW 20-29n-3e, pumped 42 bbl. oil from Bartlesville at 3,218-20 ft., TD; Layton 2,442 ft., Checkerboard 2,755 ft., Big lime-Oswego 2,850 ft., Cherokee 2,995 ft., Verdigris 3,057 ft., Skinner 3,081 ft., Red Fork 3,130 ft.

Stephens County: Dillard et al. 1 Bohannon, SW SW NE 5-3s-5w, flowed 16,157,000 cu. ft. gas from detrital sands at 1,007-1,132 ft., TD 1,865 ft.

OKLAHOMA WILDCAT FAILURES

Garvin County: Stanolind Oil & Gas Co. 3 Weller "A," NE SE NW 19-1n-1e, dry, TD 2,503 ft., conglomerate 1,032 ft., limy sand 1,079 ft. and 1,742 ft., shale 1,785 ft., sand 1,798 ft. and 1,813 ft., conglomerate 1,880 ft., strat test in NW Hoover.

Kerr-McGee 1 Perkins, SE SW SE 34-1n-3w, dry, TD 5,551 ft., Deese 1,425 ft., Springer 1,800 ft., Simpson 3,825 ft.

Grant County: Bay Petroleum 1 Hoover, C NE NW 14-29n-3w, dry, TD 4,971 ft.

Hughes County: Murta 2 Williams, NW SE NW 19-9n-11e, dry, TD 3,117 ft.

Lincoln County: Buttram 1 Lovell-Barnes, SE SE SE 29-12n-5e, dry, TD 5,067 ft.

Deck 1 Taylor, NW NE SW 1-15n-5e, dry, TD 4,420 ft.

Delta Petroleum and Dierkson-Lewis 1 Cabe, SE SE SW 29-15n-6e, dry, TD 3,320 ft.

Wilcox 1 Bennington, NE SE SW 13-16n-3e, dry, TD 4,441 ft.

Logan County: Palmer Oil 1 Seibolt, SW SW SW 15-19n-2w, dry, TD 5,593 ft.

McClain County: Pray et al. 1 Brock, C SW SW 13-5n-4w, dry, TD 9,356 ft.

Murray County: Pennington and Reinhart 1 Burch, SE SW SE 16-1n-3e, dry, TD 878 ft., sand 660 ft.

Noble County: Howell, Howell & Duncan 1 Kodesk, NW NW SE 19-24n-1e, dry, TD 4,595 ft.

Republic Natural Gas 1 Armstrong, NE NE NE 35-24n-2w, dry, TD 4,676 ft.

Okfuskee County: Ellison 1 White, SW NW NW 20-13n-9e, dry, TD 4,198 ft.

Oklahoma County: Shaw 1 Towe, SE SE SW 17-14n-1w, dry, TD 6,114 ft.

Pawnee County: Mid-Continent 1 Dallas, SW SW NE 6-21n-6e, dry, TD 3,390 ft.

Delta Petroleum 1 Kline, NW NE SE 32-22n-3e, dry, TD 4,348 ft.

Stephens County: Carter Oil 1 Everet-Willeford, C SE NE 24-2n-9w, dry, TD 10,149 ft.

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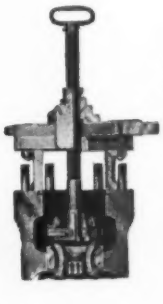

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Michigan

Offsets Staked to New Traverse Zone Discovery

MOUNT PLEASANT.—Three offsets had been staked to McClure Oil Co.'s 1 Forestry Association, NE NE SW 35-15n-18w, Golden Township, Oceana County, new Traverse zone discovery well in the Mears Dundee field area, while the discovery well was being tested following acid treatment in the Traverse with 200 gal.

First 8 hours after the treatment, well pumped and flowed 44 bbl. of net oil. On a 24-hour pump test, it produced 70 bbl. of oil with no water.

The shallow-zone discovery logged Traverse lime at 1,742 ft. and the hole was bottomed at 1,746 ft. with pay showing at 1,743-44 ft. Well flowed natural, ranging from 21 to 42 bbl. a day, depending upon choke arrangement.

Trouble was encountered with paraffin which shut off oil flow two different times, and pumping rods with scrapers were run. With this agitation, the well averaged about 35 bbl. of oil per 8-hour day natural. Further pump tests after acid were being run.

Carter Oil Co., other large leaseholder in the area, staked one location on the southeastern 40-acre offset lease to the discovery, in SW NW SE 35-15n-18w, a test which may be drilled to the Dundee before completion.

McClure Oil Co. had stakes set for two other offsets to the discovery, one at the 2 Forestry Association, SW NE SW 35-15n-18w, the diagonal southwestern 20-acre offset, and the other at the 1 State-Golden, SW SW NE 35-15n-18w, the diagonal northwestern 20-acre offset. None of the three follow-up tests had yet been spudded.

MICHIGAN WILDCAT FAILURES

Allegan County, Wayland Township: G. C. Berlin & Harry Stroud 1 Damoth, SW NE SE 7-3n-11w, Traverse 1,812 ft., dry, TD 1,843 ft.

Barry County, Irving Township: Muskegon Development Co. 1 Loftus, NE NW NE 9-4n-9w, Traverse 1,995 ft., dry, TD 2,060 ft.

Charlexoix County, Boyne Valley Township: Earl Bell 1 Smith, NW SW SE 18-32n-5w, dry in Richfield, TD 1,785 ft.

Wilson Township: McClure Oil Co., K. A. Fox & R. B. Peckham 1 Bailey, N½ NW NE 14-32n-6w, Traverse 375 ft., dry, TD 500 ft.

Gladwin County, Butman Township: Ward J. Blunt 1 Young, NW NE NE 34-20n-1w, Dundee 3,517 ft., dry, TD 3,635 ft.

Isabella County, Wise Township: Union Development Co. 1 Mullally, SE SE NE 13-16n-3w, Dundee 3,760 ft., dry, TD 3,960 ft.

Shiawassee County, Perry Township: Panhandle Eastern Pipeline Co. 1 Nemcik, SW NE NW 23-5n-2e, dry in Guelph, TD 4,795 ft.

California

Applications Indicate No Letup in Drilling Activity

LOS ANGELES.—Based on the number of drilling permits being filed by California operators, there will be no letup in the immediate future in their efforts to find new oil reserves and develop already-known reservoirs. In recent weeks the number of applications filed with the Division of Oil and Gas have averaged around 50 per week. Of the 56 permits sought last week 47 were for development and 9 were for exploratory wells. To date this year 838 notices to drill had been filed with the division as compared with 595 in the like period of 1950.

Among the new wildcats planned was a Cretaceous test to around 6,000 ft. by Signal Oil & Gas Co. in San Luis Obispo portion of Cuyama Valley. The project, known as No. 1 Signal-Harrington, SE Section 24-11n-28w, will be staked about 1 mile east of the northern portion of Russell Ranch.

Between Taylor Canyon and Morales Canyon fields in the rugged hill country north of western Cuyama Valley, Richfield Oil Corp. was preparing to get under way with a shallow test which could yield some interesting correlation data on what happens between the two fields. The test will be the 72-4 M. L. Howard in NE Section 4-11n-28w, about 1 mile northeast of Morales and slightly less than 2 miles south of Taylor Canyon. Both of these fields were 1950 discoveries, each of which has been disappointing to date with more dry holes than producers being found by offset wells.

Also in Cuyama Valley and about 7 miles east of the Russell Ranch field, Richfield has established a new depth record for the valley with its C-2 Russell. Present depth is somewhere below 12,130 ft., at which it was reported drilling and coring. Former valley depth record was held by the company's 1 Perkins, about 2½ miles east of South Cuyama in Section 27-10n-26w. It was drilled to 11,883 ft. before being abandoned last year.

In Kings County, northwestern San Joaquin Valley, a shallow wildcat which had been attracting attention, resulted in a dry hole. The test, Norris Oil Co. 1 "Well," was in SW Section 28-24s-18e, about 1½ miles southeast of Pyramid Hills production. It topped the Kreyenhagen at 905 ft., somewhat higher than was expected, and was abandoned at 1,384 ft.

Also in Kings County, in the Reef Ridge area, Sunray Oil Corp. was continuing its efforts to establish production from its 68-9 Lynch-Mauren. Late reports on the wildcat, located in Section 9-23s-17e, listed the well as having swabbed at the rate of 60 bbl. of crude daily, cut about 25 per cent and with an A.P.I. gravity of 23.8°. Production was through perforations at 8,223-11,957 ft.

Northwest of McDonald Anticline production in Kern County, Murphy Brothers, Ltd., was moving in equipment for a 5,000-ft. test. It will be the 2 M. S. T. Theta, in SW Section 2-28s-19e, about 2 miles northwest of production and on a farmout from Seaboard Oil Co. and Bandini Petroleum Co. Objective will be the Bolton sand.

CALIFORNIA WILDCAT FAILURES

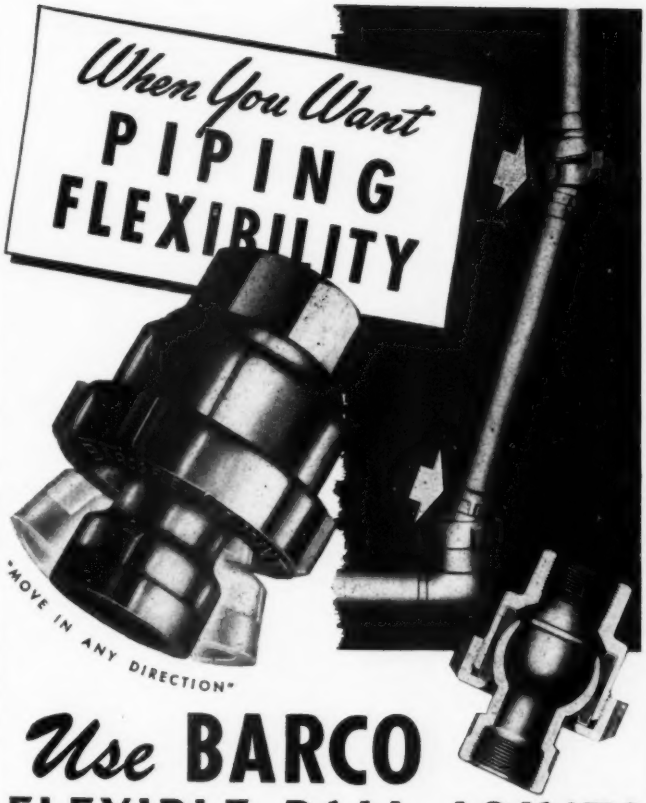
Kern County, Bacon Hills area: Superior Oil Co. 35-20 Theta, 20-28s-20e, dry, TD 6,629 ft., elev. 1,026 ft.

Santiago Creek area: Gene Reid Drilling Co. 1 Willard - K.C.L., 6-10n-22w, dry, TD 4,012 ft., elev. 1,575 ft.

Kings County, Pyramid Hills area: Norris Oil Co. 1 "Well," 28-24s-18e, dry, Kreyenhagen shale 905 ft., TD 1,384 ft., elev. unreported.

Los Angeles County, Ramona area: The Texas Co. 38 Kern, 7-4n-17w, dry, TD 2,952 ft., elev. 1,822 ft.

Sutter County, Marysville - Buttes area: H. H. Magee, Oper. 1 Brady, 28-17n-1e, dry, TD 3,273 ft., elev. 65 ft.



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Texas Gulf Coast

Gas-Distillate Well Extends North Flank of Altair Field

HOUSTON. — Superior Oil Co. has completed 1-T Mrs. Matilda Tate "D" from bottom-zone perforations from 10,715-744 ft., flowing 1,860,000 cu. ft. of gas and 30 bbl. of distillate per day through ¼-in. choke. Gravity of the distillate is 49.2°. Hole was drilled to total depth of 12,725 ft. and 5½-in. casing set at 11,644 ft. The new producer is on the north flank of Altair field in Colorado County, 4,200 ft. from production. Well is in the John Byrne Survey, A-10.

About 3,100 ft. north and east of Spanish Camp field in Wharton County, Earl T. Mackey, of Houston, completed his 1 P. V. Chumchal, in S. F. Austin Survey A-4, for open-flow potential estimated at 50,000,000 cu. ft. of gas per day. Production is from perforations from 2,956-58 ft. and 2,972½-84½ ft. Hole is bottomed at 3,312 ft. with production string set at 3,060 ft.

Five miles south of Palacios, in Matagorda Bay, Brazos Oil & Gas Co. 2 State of Texas "X-A," in Tract 195, has been completed as a new gas discovery. Casing was set at 6,311 ft., total depth 6,504 ft., and perforated from 2,655-85 ft. for production tests after perforating 5,809-10 and squeezing. Initial production was 1,735,000 cu. ft. gas per day through ¼-in. choke. Tubing pressure was 1,100 psi. Five previous efforts in this immediate vicinity resulted in dry holes.

Sinclair Oil & Gas Co. is preparing for production test at 1 Bess Henry, wildcat in William Gates Survey, A-46, about 10 miles northeast of Chapel Hill in eastern Washington County. Well is bottomed at 11,513 ft. with casing cemented at 9,540 ft. Operator will test the 9,400-ft. sand which had good shows on drill-stem tests.

The Frio zone gas production at Blanconia field, in east corner of Bee County, has been extended 1 mile westward at Kirkpatrick & Coates & Whitaker 1 John J. O'Brien, completed as a gas well from perforations 4,048-57 ft., and shut in with no gage. Total depth is 5,120 ft. and casing is set at 4,910 ft. in the Vicksburg zone, which also showed gas. Well is located in Edward & Michael Quirk Survey A-56.

George W. Graham et al. 1 O. L. Caruthers, about 6 miles southeast of Yorktown in De Witt County, flowed oil and salt water on initial production tests from perforations at 7,466-68 ft. in the Wilcox. On drill-stem test of these perforations, recovery was 540 ft. of oil and 540 ft. of salt water. Perforations have been squeezed, and operator is to reperforate opposite the Mackhank zone from 7,464-65½ ft., which showed distillate and gas on drill-stem test.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Colorado County: Gas discovery—Houston Oil Co. of Texas 1 Duncan, James Rose Sur., A-29, TD 9,597 ft., perf. 9,316-26 ft., 9,354-66 ft., 9,375-77 ft., IP: 73,600,000 cu. ft. gas per day open flow, plus 20 bbl. condensate per million cubic feet.

Jackson County: New pay in Lolita field—Abe Seibel 1-A Ware-Kelson Unit, I&GN Sur. 11, A-141, TD 8,085 ft., perf. 6,301-03 ft., IP: 45.54 bbl. oil per day, 5/64-in. choke, TP 475 psi., 39.3° gravity.

Karnes County: New pay in Hobson field—Bill Forney & Charles Winn 1 Emil Swize, Don Erasmo Seguin Grant, A-10, TD 4,047 ft., perf. 3,954-56 ft., IP: 162 bbl. oil per day, ⅛-in. choke, TP 160 psi., CP 900 psi., 32.1° gravity.

Wharton County: Gas discovery—William Carr 1 Duffy, R. T. Smith Sur., A-544, TD 5,538 ft., perf. 5,462-72 ft. and 5,478-84 ft., IP: 30,000,000 cu. ft. gas per day open flow.

Wharton County: Gas discovery—Republic Natural Gas & Chas. H. Osmond 1 J. J. Hill, W. J. Godsey Sur., A-460, TD

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5,250 ft., perf. 4,438-42 ft., IP: 5,500,000 cu. ft. gas per day, $^{3}/_{8}$-in. choke.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Brazoria County: Wm. S. Thompson 1 Nichoils et al, E. Little Sur., A-320, dry, TD 6,025 ft.

Fayette County: Oil Drilling, Inc., 1 Cherry, F. A. Beetinger $^{1}/_{2}$ Lge., A-130, dry, TD 2,200 ft.

Galveston County: Lamar Hunt Trust Estate 1 Bishop et al, Mary Austin Lge., A-1, dry, TD 11,746 ft.

Jasper County: Sun Oil Co. 1 Vidor, Sara Gray 207 Sur., A-152, dry, TD 8,021 ft.

Karnes County: J. R. Butler 1 Rudolph Kruse, Victor Blanco Sur., A-3, dry, TD 4,500 ft.

Jake L. Hamon, Edwin L. Cox, Rowe & Whitaker B-1 D. C. Lyons, V. Zapeda Grant, dry, TD 6,596 ft.

Kirkwood & Co., E. W. Gill, A. A. Seeligson, Jr., 1 Alois Pawelek, Gasper Flores Grant A-1, dry, TD 6,415 ft.

Wharton County: Ted Miller 1 L. S. McDonald, James Devers Sur., A-457, dry, TD 5,950 ft.

Mississippi

New Oil Field Indicated In Natchez City Limits

JACKSON.—Drill-stem tests virtually have assured Kemp Drilling Co. of a new oil field in the Natchez city limits, Adams County. Well is 1 Mrs. Ruth M. Gilbert, 12-7n-3w. After drilling to total depth 6,514 ft., side-wall samples were taken, indicating oil shows from 4,400-12 ft., On 20-minute drill-stem test with dual packers of interval 4,401-09 ft., $^{3}/_{8}$-in. bottom and $^{1}/_{4}$-in. top chokes, 950-ft. water cushion, recovery was water cushion and 3,300 ft. of oil, gas and oil-cut mud, and 170 ft. of salt water. Following this showing, string of $5^{1}/_{2}$-in. casing was cemented at 4,470 ft., and preparations were being made to perforate for production tests.

Kemp Drilling Co. has spudded and is drilling surface hole at Miss Irene Daigle, 62-7n-2w, proposed Wilcox sand test about 1 mile east of production in Adams County. The wildcat drilled to 7,000 ft.

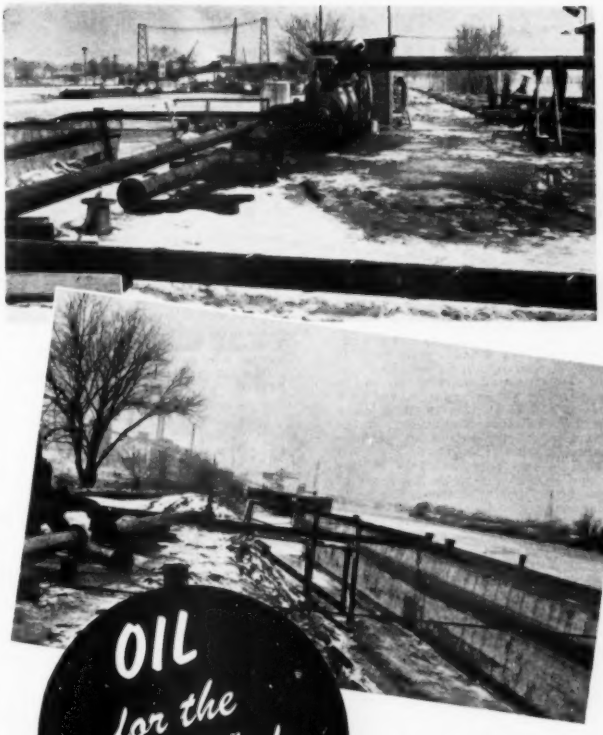
Fish has been milled out of the hole, and crews are awaiting the arrival of protective string to be run in the George Vasen et al 1 Tung Oil Corp. of America, 9-2s-11w, presently the deepest drilling well in the world. It is located northeast of Wiggins in Stone County, extreme southern Mississippi. Total depth is 20,441 ft., just short of the world's record for deep drilling.

Peterson Drilling Co. et al will rework in attempt to get 3 George W. Armstrong, 16-5n-3w, back on production. The well has already indicated oil production in Glen Aubin field of Adams County. Well flowed at rate of 225 bbl. oil per day through 10 64-in. choke on official test after perforating $6,628^{1}/_{2}$-$30^{1}/_{2}$ ft. in the Wilcox. Gravity was 45°. However, salt water broke through to kill the flow, and crews now are in process of squeezing to eliminate formation water. Hole is bottomed at 6,815 ft., with casing cemented at 6,691 ft.

Crow Well Servicing Co. is running production string to evaluate shows in the Eutaw "A" sand at 2 A. L. Pippen, 22-11n-5w, about 2 miles northeast of Gilbertown field, Choctaw County, western Alabama. Core from 3,797-3,808 ft. revealed 10 ft. of broken oil sand from a total interval of 3,797-3,812 ft. Production in this well would extend production along the fault line from Langsdale field in Clarke County, Mississippi, across the state line into Alabama.

MISSISSIPPI SUCCESSFUL WILDCAT

Wilkinson County: Oil discovery — North Lessley field—Jon Brooks, Jr., Petersen Drilling Co. et al 1 Louis Wax, 36-3n-3w, TD 8,461 ft., perf. 7,299-7,302 ft.,



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MISSISSIPPI WILDCAT FAILURES

Adams County: Humble Oil & Refining Co. B-12 C. L. S. McKittrick et al, 5-5n-2w, dry, TD 6,515 ft.

Amite County: Rees R. Oliver 1 Gallent, 6-1n-2e, dry, TD 8,518 ft.

Eastern Texas

First Well in Raines County Tests 42 Per Cent Sulfur

DALLAS.—Completion potential has been run at R. J. Caraway 1 H. L. Puckett, Raines County gas-distillate discovery. Daily potential of 203 bbl. of 55°-gravity oil was based on a 6-hour gage of 50.75 bbl. through ¼-in. choke. Open-flow gas potential was estimated at 45,000,000 cu. ft. per day. Flowing tubing pressure was 3,096 psi. The well topped the Buckner sand (overlies the Smackover formation), at 11,914 ft. and was completed from perforations between 11,958-12,126 ft.

The well is the only producer in the county and is located 6 miles southeast of the town of Emory and about the same distance northwest of Alba field, which produces a low-gravity crude from a shallow depth.

The discovery is significant in that sulfur content was reported to be running around 42 per cent. In normal times it may have been looked upon as a lemon of the highest order, but wartime demand for sulfur far exceeds the supply. A number of companies were said to be bidding for the output from Raines County's only producer of any kind, and perhaps the country's only "sulfur oil well."

EAST TEXAS (DISTRICTS 5 & 6) WILDCAT FAILURES

Falls County: Roy L. Fisher 1 Horace Atkins, L. McLennan Sur., dry, TD 1,726 ft., Buda 1,381-1,420 ft., Georgetown 1,500-1,639 ft.

C. A. Litteral 1 Claude Asher, S. W. Jordan Sur., dry, TD 1,255 ft., Buda 1,240 ft.

R. C. Wallingford 1 T. R. Depew, J. Hogan Sur., dry, TD 2,402 ft., Edwards 2,338 ft.

Hill County: B. B. Banner 1 O. E. Esterling, Caudrilla IRR Sur., dry, TD 622 ft., Woodbine 617 ft.

Lamar County: W. L. Hernstadt 1 Grady & Paul Crawford, J. Garland Sur., dry, TD 3,264 ft.

McLennan County: L. S. Torrance, Jr. 1 A. M. Schock, C. O'Campo Sur., dry, TD 1,004 ft., Buda 747 ft., Edwards 974 ft.

Wood County: Morris Palmer 1 J. H. Bryce, E. Elledge Sur., dry, TD 7,008 ft., elev. 406 ft., Austin 4,460-4,560 ft., sub-Clarksville 4,570 ft., Woodbine 4,965 ft., Paluxy 6,892 ft.

South Louisiana

Atchafalaya Bay Wildcat Tests Gas Distillate Flow

NEW ORLEANS.—Testing continues at Shell Oil Co. 1 State Lease 1593, wildcat in Atchafalaya Bay, St. Mary Parish, after the wildcat flowed gas and distillate on preliminary tests. Gage of 1,309,000 cu. ft. of gas and 34 bbl. of 51.5°-gravity distillate was recorded, with yield through 10/64-in. choke. Casing is perforated from 9,535-42 ft. Hole is bottomed at 14,697 ft. and plugged back to 9,550 ft. A 4½-in. liner is cemented at 11,795 ft.

Richardson & Bass et al are preparing to test 1-K Lafourche Realty Co., 31-19s-23e, wildcat in the east Golden Meadow area of Lafourche Parish. Five-inch casing, cemented at 14,183 ft., was perforated from 13,967-97 ft. Total depth of the possible new discovery is 15,039 ft.

Flowing 52.65 bbl. of 27.8°-gravity oil per day through 5/64-in. choke, Niloco Oil Co. and Bel Oil Corp. have completed 1 Bel-Krause (was 1 J. A. Bel) as the discovery of Reeves field in Allen Parish. Located in Section 25-6s-7w, the well was drilled to total depth of 7,515 ft., and casing, set at 6,288 ft., was perforated from 5,888-90¾ ft., opposite Frio sand. Gas volume of 98.000 cu. ft. per day accompanied the oil flow, and gas-oil ratio was 1,887:1. Operator is drilling ahead at confirmation test, 1 J. A. Bel et al, also in Section 25, 1,320 ft. north and east of the discovery.

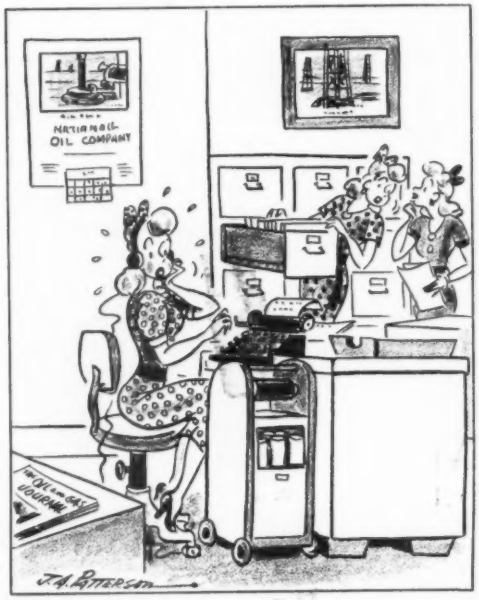
Roeser & Pendleton are coring below 9,826 ft. in sidetracked hole at 1 State Lease 1474, confirmation test to the discovery of Lake Maurepas field in Livingston Parish. Operator drilled to total depth of 10,028 ft., and plugged back to 8,800 ft. Discovery well was completed flowing 320 bbl. oil per day from perforations 9,815-50 ft.

On the north flank of Vinton field in Calcasieu Parish, Union Oil Co. of California has completed 50-G. M. Gray, 28-10s-12w, flowing 142 bbl. oil per day through 9/64-in. choke. Tubing pressure was 550 psi. and gas-oil ratio was 274:1. Gravity of the oil is 26.5°.

SOUTH LOUISIANA WILDCAT FAILURES

Avoyelles Parish: Lamar Hunt Trust Estate 1 Haas Investment Co., 36-1s-4e, dry, TD 11,834 ft.

Terrebonne Parish: Los Nietos Co. 1-1 State Lease 1795-LL&E, 28-23s-16e, dry, TD 12,475 ft.



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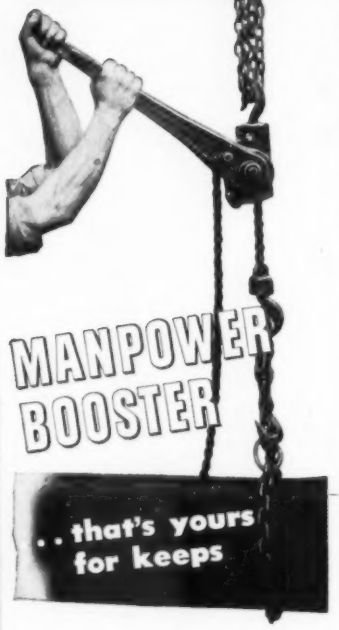

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North Central Texas

Ellenburger Field Has New Pay in Reef Lime

WICHITA FALLS.—Ohio Oil Co. 2-A Anderson has added a second new pay zone to the Frankirk Ellenburger field of Stonewall County, the latter in the Canyon reef.

A drill-stem test in the reef from 5,011-65 ft. had gas in 8 minutes and flowing oil in 62 minutes. It was flowed into pits at an estimated rate of 10 bbl. of oil an hour. Operators were pulling pipe at last report.

While the field's Ellenburger discovery had a reef section, it was said to have had no oil shows, and the Ohio well ran some 60 ft. high on the reef to the discovery. Previously the 2-A Anderson found a new pay in Canyon sand.

North of Aspermont, C. L. Norsworthy 1 Upshaw prepared to test the conglomerate after showing for a Caddo discovery. Drill-stem test from 5,957-6,001 ft. had fluid at the surface in 5 hours, and produced 51 bbl. of oil during the balance of the 13-hour test. Recovery in the pipe was 2,310 ft. of oil, 210 ft. of oil-cut mud and 120 ft. of oil-cut mud with a small show of water. At last report the well was in top of the conglomerate at 6,103 ft. and stopped to set casing at 6,110 ft. Samples showed good staining and odor.

Southwest of Aspermont, DeSoto Oil Co. 1 Bullard, Canyon sand prospect, was testing through perforations at 4,892-4,933 ft.

In Jack County, Wheeler, Ingraham & Jennings 1 C. E. Clayton completed as a conglomerate discovery, flowing 100 bbl. of 44°-gravity oil a day through 32/64-in. choke. Location is 3 miles northeast of Jermyn.

Cities Service Oil Co. has staked location for a 6,500-ft. wildcat as its 1-140 Flat Top, in Section 140, BBB&C Survey. Location, some 8 miles northwest of Hamlin, is 2 miles southeast of its 1-161 which found the Ellenburger dry but plugged back and was completed as a small Strawn pumper.

NORTH CENTRAL TEXAS (DISTRICTS 9 & 7-B) SUCCESSFUL WILDCATS

Cooke County: Acme Equipment Co. 7 W. F. Solomon West Ranch, SPRR Sur., 7 mi. NW Muenster, TD 2,429 ft., elev. 1,005 ft., pay 2,118 ft., IP pumped 32 bbl., 41°-gravity oil a day, GOR 450 cu. ft.

Eastland County: R. J. Fryer 1 Maud Beck, A. J. Beck Sur., 3½ mi. NW Ranger, TD 3,426 ft., elev. 1,604 ft., Lake sand 3,322 ft., pay 3,326 ft., IP flowed 10.4 bbl. 41°-gravity oil a day.

Jack County: J. Collier Hurley 1 L. W. Carney, J. D. Rogers Sur., 5 mi. SW Jacksboro, TD 4,905 ft., Caddo 4,520 ft., conglomerate pay 4,896 ft., IP flowed 95 bbl. 45°-gravity oil a day, 16/64-in. choke, GOR 5,100 cu. ft.

Young County: Perkins Bros. 1 Morrison Unit, TE&L Sur. 158, ½ mi. W. Olney, TD 5,049 ft., PB 3,602 ft., elev. 1,211 ft., Strawn 3,326 ft., pay 3,327 ft., IP flowed 241 bbl. 41°-gravity oil a day, 11/64-in. choke, GOR 288 cu. ft.

Reno Oil Co. 1 Warren, TE&L Sur., 2 mi. N Jean, TD 5,060 ft., Mississippian pay 5,047 ft., IP flowed 346 bbl., 40°-gravity oil a day, 20/64-in. choke, TP 450 psi., GOR 700 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: J. M. Hawley 1 W. H. Taylor, Taylor & ATNCL Sur., dry, TD 1,737 ft.

W. H. Rouzer 1 C. D. Prideaux, IRR Co. Sur. 3, 8 mi. NE Olney, dry, TD 3,815 ft.

Baylor County: B. O. M. Oil Co. 1 Burrel Mills, TE&L Sur. 3,137, dry, TD 1,464 ft.

B. O. M. Oil 1-A Burrel Mills, TE&L Sur. 2,492, dry, TD 1,556 ft.

Brown County: J. K. Wadley 1 Lillie Brewer, Sec. 29, HT&B Sur., dry, TD 2,315 ft., elev. 1,526 ft., Caddo 1,534 ft., Marble Falls 2,225 ft.

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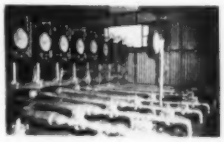

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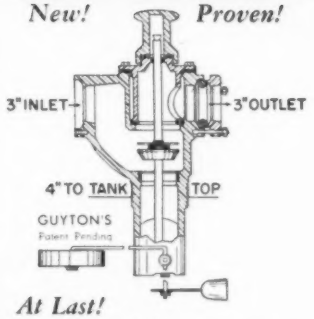

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J. K. Wadley 1 Shields, George W. Pentecost Sur., dry, TD 1,255 ft.

Callahan County: George O. Carlson 1 P. G. Hatchett, D&DAL Sur., dry, TD 2,551 ft., elev. 1,570 ft., Ranger lime 1,553 ft., Canyon sand 1,955 ft.

Jack Yonge 1 O. F. Henderson, 64-14-T&P, dry, TD 1,781 ft.

Clay County: Frank Wood 3 J. S. G. Chapin, Blk. 86, Byers Bros. Subd., dry, TD 1,234 ft.

Frank Wood 2 Lone Star Producing Co., Parker CSL, 4½ mi. SE Petrolia, dry, TD 1,811 ft.

Coleman County: E. N. Goodrich 1 Walter Pitts, A. G. Foley Sur., dry, TD 2,914 ft.

Hickok & Reynolds 1 Mrs. M. B. Miller, C. M. Mann Sur. 76, dry, TD 3,007 ft., Caddo 2,780 ft.

L. J. Maxwell 1 A. A. Young, Casper Escher Sur., dry, TD 1,980 ft.

Stephens Petroleum Co. 1 Herring, J. R. Merrill Sur., dry, TD 3,760 ft., elev. 2,082 ft., limestone 3,330 ft.

Comanche County: Terrell Petroleum Co. 1 J. M. McPherson, Wm. Farquhar Sur., dry, TD 2,920 ft.

Cooke County: Empire Drilling Co. 1 J. E. Taylor, H. Nail Sur., dry, TD 1,550 ft.

W. B. Hamilton 1 Danglemayr, Cromwell & Hawley Sur., dry, TD 1,410 ft.

W. B. Hamilton 1-B Danglemayr, BBB&C Sur., dry, TD 1,398 ft.

Harvey Drilling Co. 1 Alice Sharp, H. Walker Sur., dry, TD 2,650 ft.

Oil Hunters, Inc. 1 F. B. Cates, B. F. Yarbrough Sur., dry, TD 3,143 ft.

J. R. and Adam Seitz 1 Joe Bowers, T. Toby Sur., dry, TD 3,152 ft.

Eastland County: Bankline Oil Co. 1 C. Kleiner, 71-4-H&TC, dry, TD 3,616 ft., Elev. 1,153 ft., Caddo 3,276 ft.

Jack County: C. B. Christie 1 R. C. Christian, M. Rockerfellow Sur., dry, TD 3,052 ft.

Hastings and Anderson 1 Shown "A," Daniel Crenshaw Sur., dry, TD 4,721 ft.

Jones County: Cree & Sabo 1 L. E. Rector, Rodriquez Sur., dry, TD 4,743 ft., elev. 1,826 ft., Dothan 2,765 ft.

W. A. Moncrief 1 Sam Swann, S. Miley Sur., dry, TD 4,753 ft., elev. 2,100 ft., Noodle Creek 2,635 ft.

Montague County: Harvey Drilling Co. 1 H. D. Fields, C. Forester Sur., dry, TD 2,826 ft.

Stephens County: Leonoir M. Jose, Inc. 1 J. W. McDonald, 43-5-T&P, dry, TD 3,863 ft., Caddo 3,165 ft., Marble Falls 3,700 ft.

Taylor County: Continental Oil Co. 1 C. F. Sears 235, 235-64-H&TC, dry, TD 6,003 ft., elev. 2,445 ft., Ellenburger 5,711 ft.

Wilbarger County: A. R. Dillard 1 W. J. Baker, 85-14-H&TC, dry, TD 3,317 ft.

John & Pat O'Neil 1-E Waggoner, 4-13-H&TC, dry, TD 2,000 ft.

C. C. Winfrey 1 G. B. Ancell, 26-6-H&TC, dry, TD 2,130 ft.

Frank Wood 1 W. T. Waggoner "JJ," 21-4-H&TC, dry, TD 2,100 ft.

Wise County: Larson & Thomas 1 J. S. Perry, Ed Stevens Sur., dry, TD 1,564 ft.

Young County: Reno Oil Co. 1-B Shappel, W. Sargent Sur., dry, TD 3,810 ft.

S. Stephens 1 O. L. Kimbrell, A. C. Gilmore Sur., dry, TD 3,145 ft.

Appalachian-Ohio

Two Gassers Completed in Garrett County, Maryland

PITTSBURGH.—In Garrett County, Maryland, two wells were completed: Nollem Oil & Gas Co. 1 A. D. Nailor, elevation 2,393 ft., gaging 1,500,000 cu. ft. of gas from Oriskany sand topped at 3,428 ft., total depth 3,490 ft.; Eberly & Snee 1 Virginia E. Baker, elevation 2,415 ft., 370,000 cu. ft. gas, Onondaga 3,072 ft., chert 3,099 ft., Oriskany sand 3,222 ft., gas 3,246 ft., total depth 3,905 ft. Both of these wells were acidized.

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West Virginia, Owens, Libbey-Owens 7-816 Koontz Realty Co. gaged 1,913,000 cu. ft. of gas from the Big lime, total depth 1,833 ft. Sherman district, Calhoun County, Scott Duffield 2 Mary Faulkner brought in 1,555,000 cu. ft. of gas from the Big Injun sand, total depth 2,009 ft.. C. C. Dodd 5 Hunter M. Bennett was brought in for 50 bbl. of oil and 200,000 cu. ft. of gas from the Berea sand, total depth 2,100 ft. Union district, Putnam County, West Virginia Gas Corp. 1-558 8 Arthur King et al completed 1,250,000 cu. ft. of gas from the Brown shale, total depth 4,134 ft.

MARYLAND SUCCESSFUL WILDCATS

Garrett County: Nollem Oil & Gas Co. 1 A. D. Nailor, elev. 2,393 ft., 1,500,000 cu. ft. of gas after acidizing, Oriskany sand 3,428 ft., gas 3,432 ft., total depth 3,490 ft.

Eberly & Snee 1 Virginia E. Baker, elevation 2,415 ft., 370,000 cu. ft. of gas after acidizing, Onondaga 3,072 ft. chert 3,099 ft., Oriskany sand 3,222 ft., gas 3,246 ft., TD 3,905 ft.

OHIO

COLUMBUS.—Calhoun & Hall has brought in one of the best producers yet found in the Holmes—Ashland Berea sand field with 1 W. V. Denny, Section 33, Washington Township, Holmes County. The first sand from 580-646 ft. gaged 300,000 cu. ft. gas and second sand at 651-707 ft. made a good showing of oil. The lower sand was shot with 110 qt. and the well flowed 80 bbl. in 24 hours.

Pure Oil Co. 3 Charles Richards, New Castle Township, Coshocton County, made 42 bbl. natural. The Clinton was reported at 3,242-95 ft. The well made 55 bbl. the first day after a 60-qt. shot.

Moran Bros. 1 Frank McKee, Hanover Township, Licking County, made 50 bbl. and an estimated 500,000 cu. ft. gas in 24 hours after a 120-qt. shot.

William Patton et al. E. S. Greer, Jefferson Township, Knox County, came in as a small pumper. Second Clinton was logged at 2,888-2,901 ft., and produced 18 bbl. in 24 hours after shot.

Permian Basin

Spraberry Stepout Cores Oil Shows in Lower Zone

MIDLAND.—West of the Midkiff Spraberry area in Midland County, operators prepared to make a second attempt at drill-stem testing in the Los Nietos Co. 1 Youngblood. The well has attracted considerable interest as another possible Spraberry strike.

A core in the lower Spraberry from 8,197-8,241 ft. recovered 21 ft. of sand and shale, bleeding oil and gas. Elevation is 2,005 ft., and top of the sand was reported at 7,633 ft.

Cores to 7,704 ft. had some shows of oil but a drill-stem test from 7,640-7,704 ft., recovered 300 ft. of gas-cut mud with a light oil show, and 700 ft. of sulfur water. A test from 7,793-7,863 ft., open 2 hours and 15 minutes, had gas in 25 minutes and recovered 800 ft. of heavily gas-cut mud.

Plymouth Oil Co. 3-S W. M. Standifer, Spraberry test in the Benedum area of Upton County, prepared to Hydrafrac in open hole from 7,247-7,312 ft. The section tested some 600,000 cu. ft. of dry gas daily on drill-stem test. Location is 3 miles south of nearest Spraberry production on the northern side of the field.

In southwest Martin County, Blackwood & Nichols 1 Stimson and Burley topped the Spraberry at 7,833 ft. on elevation of 2,846 ft. A 6½-hour test from 7,835-7,910 ft. developed 1,300 ft. of gas-cut mud with no oil shows. It was drilling ahead.

In Kent County, southwest of the Salt Creek field, Texas Gulf Producing Co. 1 J. W. Young was drilling below 7,060 ft. after drill-stem testing in the Strawn. First test from 6,910-73 ft. recovered 90 ft. of slightly oil and gas-cut mud, plus 380 ft. of heavily oil and gas-cut mud. Time was 94 minutes. Second test, open 1 hour, from 6,980-7,020 ft., recovered 90 ft. of slightly gas-cut mud with very light oil show. Top of the Strawn was 6,663 ft., on elevation of 2,139 ft.

Amerada Petroleum Corp. 1 Bertie Boone, Tex Harvey field extension well on the north side of the field, completed as a pumper, making 108 bbl. of oil plus some water. It was produced from the sand between 6,990-7,160 ft.

Paul Barnhart 1 V. P. Tippett, Union County wildcat 5 miles from nearest production in the Pembrook field, made a flow of 75 bbl. of clean oil in 4 hours through open tubing after treating with Hydrafrac in open hole from 7,090-7,233 ft. Top of the Spraberry was 7,169 ft., on elevation of 2,740 ft. Operators set casing at 7,090 ft. The well was shut in for storage tanks.

Northeast of the Parks field of Midland County, The Texas Co. 1-C Schartbauer acidized and prepared to test on perforations at 10,410-500 ft., in the Pennsylvanian. Previous perforations from 10,625-710 ft. were cemented off after developing salt water with a little oil.

The Texas Co. 1-D Scharbauer, northwest offset to a Dean sand discovery southwest of Midland, was drill-stem testing in the Pennsylvanian from 10,325-401 ft.

Gulf Oil Corp. 1 Lowe, deep Terry County exploration northeast of Brownfield, had total depth of 11,650 ft. and was reaming out after coring from 11,619-650 ft. Recovery was 31 ft. of Mississippian limestone and chert. From 11,625-630 ft. the core showed some porosity and was bleeding oil and salt water. Previous core from 11,610-619 ft. recovered limestone with oil stains.

In Garza County, 12 miles northeast of the town of Post, Stanolind Oil & Gas Co. 1 Hill ran a drill-stem test from 7,465-95 ft. Recovery in 3 hours was over 6,000 ft. of salt water. It was drilling ahead. In Martin County, Stanolind's 1 Mulkey, southeast of Stanton, reported top of the Mississippian at 10,575 ft.

WEST TEXAS (DISTRICTS 8 & 7-C) SUCCESSFUL WILDCATS

Kent County: Kewanee Oil Co. 1 Oliver, 11-1-H&GN, TD 6,722 ft., elev. 2,129 ft., reef 6,380 ft., perf. 6,376-6,502 ft., flowed 604 bbl. 38°-gravity oil a day, 36/64-in. choke, GOR 551 cu. ft., TP 700 psi.

Midland County: James H. Snowden 1-34 W. M. Schrock, 34-37-4s-T&P, TD 7,075 ft., elev. 2,719 ft., Spraberry 7,026 ft., flowed 393.8 bbl. 39°-gravity oil a day, ½-in. choke, GOR 589 cu. ft., TD 450-75 psi.

The Texas Co. 1-B Scharbauer, 35-40-2s-T&P, TD 10,875 ft., elev. 2,809 ft., Strawn 10,290 ft., perf. 10,290-10,325 ft., flowed 660 bbl. 55°-gravity oil a day, ¾-in. choke, GOR 2,660 cu. ft., TP 2,300-2,610 psi.

Pecos County: J. S. Meriwether, Jr., 1 H. J. Eaton, TI&M Sur., 6 mi. W Ft. Stockton, TD 4,000 ft., pay 2,633-2,840 ft., 2,000,000 cu. ft. gas.

Reeves County: Francis K. Campbell and Ford Chapman 1 J. M. Hickey & Sons, 17-56-PSL, TD 3,186 ft., elev. 3,243 ft., Castile 1,922 ft., pay 1,923 ft., pumped 27.6 bbl. 29°-gravity oil; Campbell suggested field name.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Andrews County: Fullerton Oil Co. 1 G. L. Grogan, 21-A31-PSL, TD 10,305 ft., elev. 3,367 ft., Devonian 8,160 ft., Fusselman 9,190 ft., Simpson 9,308 ft., Ellenburger 10,228 ft.

Borden County: Hunt Oil Co. 1 R. L. Gray, 224-97-H&TC, TD 8,374 ft., elev. 2,375 ft., Pennsylvanian 6,670 ft., Strawn 7,649 ft., Mississippian 8,165 ft., Ellenburger 8,315 ft.

The Texas Co. 1 L. D. Rogers, 29-31-3n-T&P, dry, TD 8,110 ft., elev. 2,452 ft., Spraberry 5,590 ft., reef 7,955 ft.

Concho County: High Tower Oil & Refining Co. 1 D. G. Bishop, Sec. 11, H&TC, dry, TD 2,250 ft., elev. 1,760 ft., Ellenburger 2,200 ft.

Crane County: Cities Service Oil Co. 1

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University "AN," 14-31-University, dry, TD 4,501 ft., Grayburg 2,865 ft., San Andres 3,210 ft.

George P. Livermore, Inc. 1 E. B. Jones, 12-3-H&TC, dry, TD 4,170 ft., elev. 2,450 ft., Clear Fork 3,570 ft.

The Texas Co. 1 Edith Terry, 11-35-H&TC, dry, TD 6,035 ft., elev. 2,330 ft., San Andres 2,010 ft., McKee 5,070 ft., Simpson 5,035 ft.

Crockett County: Texas Pacific Coal & Oil Co. 1 University "I," 31-7-University Lands, dry, TD 2,971 ft., Yates 1,739 ft., Grayburg 2,785 ft.

Culberson County: Paul F. Lawlis 1 James H. Logan, 11-114-PSL, dry, TD 2,300 ft.

Gaines County: Magnolia Petroleum Co. B-2 Stella Scanlan, 117-M-ELRR, dry, TD 9,885 ft., elev. 3,162 ft., San Andres 4,570 ft., Spraberry 7,690 ft., reef 9,620 ft.

Garza County: T. J. Silvey 1 Tom Henderson, Sec. 1237, I&GN, dry, TD 3,164 ft.

Midland County: Jay Simmons et al 1 J. W. Countiss, 20-39-2s-T&P, dry, TD 10,508 ft., elev. 2,802 ft., Spraberry 7,805 ft., Dean 9,150 ft., Wolfcamp 9,360 ft., Pennsylvanian 10,420 ft.

Pecos County: Harold Hamilton et al 1 I. G. Yates, 36-178-TCRR, dry, TD 1,608 ft. in sand.

Tom Green County: Aurora Gasoline Co. 1 Wilbur Brown, G. Hild Sur., dry, TD 6,796 ft., elev. 1,966 ft., Ellenburger 6,575 ft.

Winkler County: Humble Oil & Refining Co. 1 R. M. Evans, 2-A56-PSL, dry, TD 13,638 ft., elev. 3,117 ft., Clear Fork 6,250 ft., Mississippian 10,136 ft., Woodford 10,735 ft., Devonian 11,200 ft., Fusselman 12,000 ft., Simpson 12,650 ft., Ellenburger 13,574 ft.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCATS

Eddy County: George D. Rigs 1 Welch, 5-21s-27e, TD 441 ft., elev. 3,290 ft., Yates 381 ft., pay 542 ft., IP pumped 100 bbl. 20 -gravity oil, plus water.

Lea County: Lawton Oil Corp. et al. 1-A State, 30-15s-33e, TD 10,621 ft., elev. 4,225 ft., Pennsylvanian 10,212 ft., pay 10,587 ft., IP flowed 336 bbl. 42 -gravity oil a day, 1/4-in. choke.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Chaves County: Magnolia Petroleum Co. 2 Black Hills Unit, 31-17s-20e, dry, TD 5,160 ft., elev. 4,957 ft., Pennsylvanian 4,260 ft., Devonian 4,789 ft.

Lea County: Amerada Petroleum Co. 1-U.S.A. West Monument, 23-20s-35e, dry, TD 4,542 ft., elev. 3,699 ft., Yates 3,922 ft.

Southern Union Gas Co. 1-T State, 1-20s-37e, dry, TD 4,095 ft., elev. 3,590 ft., Yates 2,760 ft., Grayburg 3,860 ft.

LEGAL

U.S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that the SW1/4 sec. 24, T. 34 S., R. 41 W., 6th P.M., Kansas, 40 acres, within the known geologic structure of the Hugoton gas field, undefined, will be offered for oil and gas leasing, through competitive bidding, at 1 p.m., Eastern Standard Time, June 13, 1951, when bids will be opened. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to this office. Marion Clawson, Director.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that 2059.14 acres in the Barksdale Air Base, Bossier Parish, Louisiana, will be offered for oil and gas leasing in three parcels, through competive bidding, at 1 p.m. Eastern Standard Time, June 6, 1951, when bids will be opened. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Oil and Gas Supervisor, U.S. Geological Survey, Box 311, Tulsa, Oklahoma, or from the Director, U.S. Geological Survey, Washington 25, D.C., or to this office. Marion Clawson, Director.

Rocky Mountain

Companies Step Up Activity Throughout Uinta Basin

DENVER.—Activity has intensified throughout the Uinta basin despite another deep-test failure. This week Carter Oil Co. announced location for two new deep tests in Roosevelt field, one a pool well and another a 3-mile step-out west of production. Carter and Stanolind Oil & Gas Co. plugged their 1 Unit, C SW SE 6-1s-2w, at Blue Bell, at 12,518 ft., total depth, in Wasatch. This wildcat is 15 miles west of the Roosevelt field and tested the deepest section so far in the current Tertiary campaign through the center of the basin.

Carter and Stanolind did extensive testing in the well prior to plugging, but found only water in the basal Green River zone productive at Roosevelt at around 9,200 ft. Carter's two new Roosevelt locations are 1 Lloyd, C NW SW 24-1s-1e, and 1 Ute Tribal "B", C NE SW 20-1s-1e. The discovery in this field flowed more than 1,600 bbl. of light green, high-paraffin-content oil daily through choke.

Sun Oil Co. also entered the Tertiary drilling program this week, for the first time in this area. Its 1 Unit C NE NE 22-9s-20e, in the South Ouray area, will be the first Tertiary test this far south in the basin. Gulf Oil Corp., Continental Oil Co., and others have plans for wildcats this year.

Carter is presently drilling three deep wildcats in the basin, in addition to the recent Blue Bell failure and the two new locations. Phillips Petroleum Co. also announced location for a wildcat west of Roosevelt this week. The California Co. this week tested gas in a basal Green River zone at its second well in the Red Wash area, SW SW SW 24-7s-23e, Uintah County. The operator cemented casing and is coring below 5,312 ft.

Another wildcat of interest in Utah found oil this week. A. K. Wilson of Salt Lake City is running casing at 1 State, SE SW SW 2-24s-13e, cable-tool wildcat in the Iron Wash area, Emery County. The well topped Moenkopi at 1,751 ft. and found a 2-ft. saturated sandy-lime section between 1,967-69 ft. The operator bailed more than 7 bbl. of oil daily from the zone, with total depth at 1,969 ft., and is now running casing to shut off water from above and complete. Operator plans to acidize. Shows in this zone are believed by some geologists to be of considerable significance, since the well is in an area where there has been little wildcat drilling.

Wildcat drilling through the Denver-Julesburg basin continues with new discoveries extending the play southwest. South Texas Development Co. of Houston this week is completing a discovery in the Messex area, northeastern Morgan County, and west of the Merino pool. The well, 1 State, NE NE NW 1-5n-55w, flowed from the J (Dakota) sand on 40-minute test. The operator has cemented casing for completion.

South of this wildcat, in Adams County, Orin Tucker et al. found gas at 1 Hough, NW NE NE 1-2s-57w, and have shut in the well for final gage.

COLORADO WILDCAT FAILURE

Pawnee Creek: Trigood Oil Co. J-7 Hoover, NE NE SE 4-7n-54w, TD 5,073 ft., abandoned. Pierre 775 ft., Niobrara 4,043 ft., Ft. Hays 4,356 ft., Greenhorn 4,593 ft., 1st Dakota 4,855 ft., 3rd Dakota 4,948 ft.

WYOMING WILDCAT FAILURES

Dad Area, Carbon County: Sinclair Oil & Gas Co. 1 Unit, SW NE NW 11-15n-91w; TD 8,805; abandoned. Mancos 2,691 ft., Frontier 7,357 ft., Muddy 8,215 ft., Dakota 8,279 ft., Lakota 8,374 ft., Morrison 8,396 ft., Sundance 8,687 ft., Nugget 8,781 ft.

South Meadow Creek, Johnson County: Sinclair Oil & Gas Co. 1 Thomas Weadick; SW SE NW 23-41n-78w; TD 7,500 ft; abandoned. Teapot 2,038 ft., Parkman 2,400 ft., Sussex 3,520 ft., Shannon 4,034 ft., Niobrara 5,382 ft., first Frontier 6,044 ft., second Frontier 6,429 ft., Muddy 7,159 ft., Dakota 7,338 ft., Lakota 7,414 ft., Morrison 7,470 ft.

South Sussex, Johnson County: Continental Oil Co. 1 Taylor SE NW NE 26-42n-78w; TD 4,553 ft.; abandoned. Parkman 2,925 ft., Sussex 4,005 ft., Shannon 4,522 ft.

MONTANA WILDCAT FAILURE

Womans Pocket, Golden Valley County: Amerada Petroleum Corp. 1-"A" NPRR "A"; C SW SW 1-8n-20e; TD 3,155 ft.; abandoned. First Cat Creek 1,935 ft., Kootenai 2,024 ft., second Cat Creek 2,205 ft., third Cat Creek 2,260 ft., Morrison 2,343 ft., Ellis 2,607 ft., Piper 2,785 ft., Kibbey 2,873 ft., Charles 3,063 ft.

NEBRASKA WILDCAT FAILURE

Marlowe Area, Cheyenne County: Ohio Oil Co. 1 W. A. Sparks, NE SE NE 29-15n-49w; TD 4,710 ft. Niobrara 3,697 ft., Ft. Hays 3,984 ft., Codell 4,078 ft., Greenhorn 4,224 ft., first Dakota 4,502 ft., second Dakota 4,568 ft., third Dakota 4,631 ft.

Canadian Fields

Wizard Lake Strike Taps D2 Production

CALGARY.—Texaco Exploration Co. and McColl-Frontenac Oil Co., Ltd., have made a D2 Devonian oil discovery at their Wizard Lake wildcat, following a Viking sand gas discovery and a Lower Cretaceous oil discovery at the same well. The Wizard Lake venture is located 5 miles southwest of the current producing limits of the Leduc oil area. The well, Texaco-Wizard Lake 2, topped the D2 zone at 5,634 ft., at a somewhat lower elevation than the D2 productive elevations in Leduc field. The first drill-stem test was run from 5,687-5,708 ft., with gas reaching surface in 6 minutes, at a 184,000-cu. ft. daily rate. Pipe was pulled after 1 hour and recovery was 1,980 ft. of gassy crude oil and 360 ft. of oil and gas-cut drilling mud. Successive tests gave comparative results. The latest test, from 5,728-38 ft., had a gas flow rate of 184,000 cu. ft. daily plus 90 minute pipe recovery of 1,600 ft. of oil and 180 ft. of oil-cut mud. Coring is proceeding below 5,738 ft., and crew will head for its next objective Devonian D3 zone. Wizard Lake 2 is located in LSD 12, 22-48-27w4.

The seventh oil success at Golden Spike for Imperial Oil, Ltd., discoverer of that field, struck oil in three zones of the Devonian. The well, rated as 1/2-mile extension to the south and east of previous production, is now continuing to core in the D3 horizon, after flowing oil during the latest drill-stem test in that lower zone. The prolific well is Imperial-Golden Spike 11, in LSD 11, 23-51-27w4, 1/2 mile east of 1 discovery well, and the same distance south of 4, both D3 oil producers. Assured success came when a drill-stem test at 5,851-5,916 ft. gave a maximum natural gas flow rate of 450,000 cu. ft. daily, with oil flowing in 12 minutes. When pipe was pulled after the 30-minute test it was found to contain 1,620 ft. of oil. Coring is now proceeding below 5,950 ft. D3 zone was topped at 5,342 ft., or 3,018 ft. subsea, but the above mentioned test was the first run in D3.

Golden Spike 11 contacted the D2 zone at 4,998 ft., or 2,674 ft. subsea, and flowed oil during two drill-stem tests run between 5,026-66 ft. Oil did not flow when tests were run in the D1 Devonian horizon, but a substantial recovery of oil was obtained in drill-stem test from 4,618-60 ft. Gas flow rate during that test was 450,000 cu. ft. daily, and as pipe was being pulled it flowed oil, with final recovery being 1,260 ft. of oil and 270 ft. of salt water.

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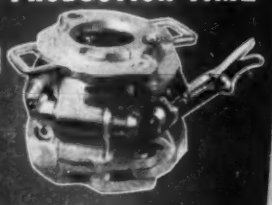

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D1 top came in at 4,440 ft., or 2,116 ft. subsea.

Canadian Delhi Oil, Ltd., in its natural-gas exploratory and development program, has struck gas in large volume at another Alberta driller, a ¾-mile stepout venture in the Picardville area. During a Viking sand drill-stem test, Delhi's new gasser flowed at a rate of nearly 7,000,000 cu. ft. daily. Production string of casing has now been set, and crew will likely run potential tests prior to capping the well. The new producer is Delhi-Union-Picardville 2, in LSD 11, 6-59-26w4, ¾ mile northwest of Union-Picardville 1, gas discovery well, and about 25 miles west-northwest of Redwater Devonian oil field. An 85-minute drill-stem test was run of the Viking interval at 2,702-2,807 ft., with maximum natural gas flow rate measured at 6,800,000 cu. ft. daily.

Husky Oil & Refining, Ltd., and Phillips Petroleum Co., found a good showing of heavy crude oil during a drill-stem test at its Eatonia wildcat in the southwestern sector of Saskatchewan, about 30 miles east of the Alberta border. Full details of the test have not been received, and it is not as yet possible to fully evaluate the commercial possibilities of the "black oil" strike. The well is Husky-Phillips-Eatonia 1, in LSD 4, 32-26-24w3, located about 16 miles southwest of Kindersley town, and 120 miles southwest of Saskatoon. Albercan Oil Corp.'s heavy crude oil discovery made last year is located about 55 miles north-northwest of the Husky-Phillips' venture. The black oil show was obtained during a test run around the 2,978-ft. level. Gravity of the oil is between 12°-14°, comparable to Lloydminster type crude.

CANADIAN SUCCESSFUL WILDCATS

Amerada-Crown F41-5, LSD 16, 5-27-14w4, TD 3,716 ft., 2,800,000 cu. ft. gas.

Bailey-Westlock 1, LSD 1, 22-60-26w4, TD 4,280 ft., gas discovery.

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Illinois-Ind.-Ky.

Good Oil Flow Made by Wabash County Wildcat

A PROMISING oil discovery appears to have been made at the north edge of the Bellmont townsite, 7 miles east of Albion, in Wabash County, Illinois, where George Ellison and associates swabbed 65 bbl. of clean oil in 2½ hours while testing a saturated O'Hara zone in their 1 Epler, NE SE NE 36-1s-14w. The zone is open through casing perforations at 2,836-44 ft. Total depth is 2,846 ft. Casing was run to bottom.

The discovery, with prospects of a townsite drilling play, is located about a mile from nearest production, being about equidistant west of production in the new Harmony-Keensburg Consolidated pool and northeast of the Browns South pool. It is about 2 miles southeast of production in the main Browns pool area. A north offset, 1 Ellison, SE NE NE 36-1s-14w, already is nearing the pay zone.

Another new pool, located 2 miles northwest of Eberle, in Effington County, Illinois, also is indicated by showings encountered by Robinson & Puckett in their 1 Becker, NW NW SE 23-6n-6e. Prospective pay zone is the Rosiclare lime, logged at 2,675-89 ft. Operators recovered 330 ft. of clean oil, 60 ft. of mud-cut oil and 30 ft. of oil-cut mud in a drill-stem test of the zone, taking in an interval at 2,671-80 ft. No water was indicated. Bottom-hole pressure was 922 psi. Tester was open 60 minutes. Nearest production is about a mile to the east in the Eberle pool.

E. A. Obering's prospective Silurian discovery well in northwestern Washington County, on the west side of the Illinois basin, swabbed at the rate of 2 bbl. of oil per hour in initial tests following injection of 500 gal. of acid. The well will be reacidized for additional tests before completion. The well is 1 Baldwin. Location is in the NE SE SE 15-1s-4w. It is about 2 miles east of Okaville and about 8 miles southwest of the South Bartelso pool in southern Clinton County. Top of the Silurian is at 2,323 ft. with surface elevation of 440 ft. Hole was drilled to 2,334 ft. and is open below 2,324 ft.

Production in the Zion pool, 7 miles east of Henderson, Henderson County, western Kentucky, is being extended ½ mile to the south. The extension well, Blalock & Walters 1 Quinn Heirs, SW NW NE 9-P-25, flowed at the rate of 38 bbl. of oil during a production test after acidizing with 2,000 gal. Pay zone is McClosky lime. Best saturation was logged at 2,165-79 ft. Total depth is 2,181 ft. with casing at 2,161 ft.

ILLINOIS WILDCAT FAILURES

Clinton County: H. H. Derrington 1 Stein, SE SE SW 16-2n-1w, dry, TD 1,506 ft.

Logan County: H. Herring 1 Starr et al., SW NW NE 22-18n-3w, dry, TD 1,610 ft.

Marion County: Inland Oil Co. 1 Garrish, SW NE NE 17-3n-1e, dry, TD 1,694 ft.

INDIANA SUCCESSFUL WILDCAT

Vigo County: T. & H. Corp. 1 Bettenbrock, SE NE SW 36-12n-9w, IP 152 bbl., Devonian 1,625-28 ft. and 1,635-46 ft., TD 1,653 ft. (opens new pool).

INDIANA WILDCAT FAILURES

Daviess County: Dome-Minnick Oil Co. 1 Hasler, SW SE NE 9-5n-6w, dry, TD 734 ft.

Dome-Minnick Oil Co. 1 Walls, NW SW SE 9-5n-6w, dry, TD 750 ft.

National Associated Petroleum Co. 1 Capehart, NW NE SW 20-4n-7w, dry, stratigraphic test, information withheld.

Gibson County: Barron Kidd 1 Refing, NE NE SW 1-3s-10w, dry, TD 2,106 ft.

Knox County: Walton Drilling Co. 1 Structmeir, east corner Militia Donation 240-5n-8w, dry, TD 1,415 ft.

Owen County: Pure Oil Co. 1 Andrews, NE SE SW 32-10n-5w, dry, TD 1,657 ft.

Posey County: George S. Engle 1 Hillen-

brand-Benner, NE NW SE 8-7s-12w, dry, TD 2,755 ft.

Sun Oil Co. 1 Robb, NW NW SE 3-4s-13w, dry, TD 2,943 ft.

Spencer County: I. L. Morris 1 Gogel, S½ NW NW SW 25-3s-5w, dry, TD 769 ft.

Sullivan County: F. B. Cline 1 Cook et al, SW SE NW 27-9n-9w, dry, TD 2,286 ft.

H. R. Snavely 1 Raines, S½ NW NE SW 7-8n-8w, dry, TD 177 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Muhlenberg County: Roy Beard 1 Williard Hunt, NE SE SE SE 20-H-31, 1P 10 bbl., Jackson 522-42 ft., TD 542 ft. (opens Hunts School pool).

WESTERN KENTUCKY WILDCAT FAILURES

Breckinridge County: E. L. Newton 1 Virgil Moore, SW SE NE SW 16-P-39, dry, TD 1,685 ft.

Henderson County: R. E. Hupp et al 1 Elliott Toy, SE NE SW NE 2-O-24, dry, TD 2,456 ft.

(Continued on page 191)

Massive anhydrite 3,943 ft., Sligo 5,680 ft., Pettit 5,742 ft. Total depth is 5,860 ft.

North Louisiana.—LaSalle Parish got a new Wilcox strike when J. S. Michael Co. C-2 Nebo Oil Co. flowed at the rate of 309 bbl. of oil per day from perforations at 3,984-90 ft. Total depth is 4,514 ft., with 7-in. casing run to 4,325 ft. "Rogers" is the proposed name for the area, located in the northeast corner of Section 9-6n-3e.

Two new shallow wildcat successes in the Caddo-Pine Island area are expected to start a new play in that section of Caddo Parish. D. C. Carnes 1 Kennonwood Corp., 5-19n-15w, flowed some 35 bbl. of oil per day by heads from the Paluxy at 2,440-48 ft. The well is cased with 5½-in. string to bottom 2,551 ft. The same operator's 1 Slattery, 15-19n-15w, flowed more than 80 bbl. of oil per day, on choke, from the same pay zone at 2,435-50 ft. Total depth is 2,558 ft.

In Bienville Parish, Lake Bistineau field got its first new well in some time. Munoco Co. 1 Cagle, 18-16n-9w, tested a daily open flow of 8,500,000 cu. ft. of gas plus some distillate from the Pettit. Perforations were made at 5,169-85 ft., 5,190-5,214 ft., and 5,248-62 ft.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Claiborne Parish: Zach Brooks Drilling and Midstates 1 M. L. Hunt, 660 ft. S and 862 ft. W NE cor. 21-23n-7w, 30 bbl. oil from Gloyd at 4,458-61 ft., TD 5,196 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: W. J. Weaver et al 1 W. A. McMichael, NW NW NW 15-17n-15w, dry, TD 3,817 ft.

Claiborne Parish: C. E. Murdock et al 1 J. P. Bailey, 230 ft. S and 330 ft. E NW cor. SW SW 8-20n-7w, dry, TD 2,965 ft.

ARKANSAS WILDCAT FAILURE

Nevada County: J. K. Wadley 1 Warmack, NE NE NE 36-13s-22w, dry, TD 3,990 ft.

Louisiana-Arkansas

North Shongaloo Extension May Make Two-State Pool

SHREVEPORT.—A two-state field is apparently assured by Stanolind Oil & Gas Co. 1 Pine Woods Lumber Co., 11-20s-22w, Columbia County. The test is a 1-mile north outpost to North Shongaloo field in Webster Parish, Louisiana. Operator ran 5½-in. casing to 5,855 ft., preparatory to testing perforations in the Pettit at 5,743-52 ft., 5,757-70 ft., 5,776-81 ft., and 5,794-5,813 ft. The well flowed at a 20-bbl. per hour rate, settling down to 9 bbl. per hour. Perforations have been acidized and testing is continuing. The following tops were logged:

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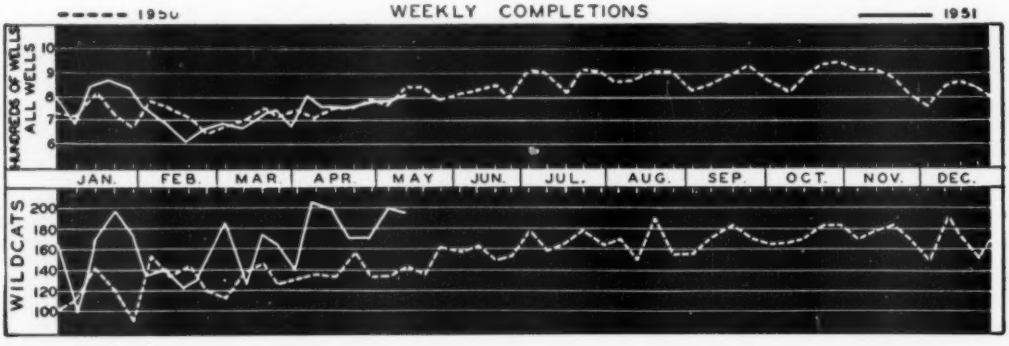
CURRENT STATISTICS

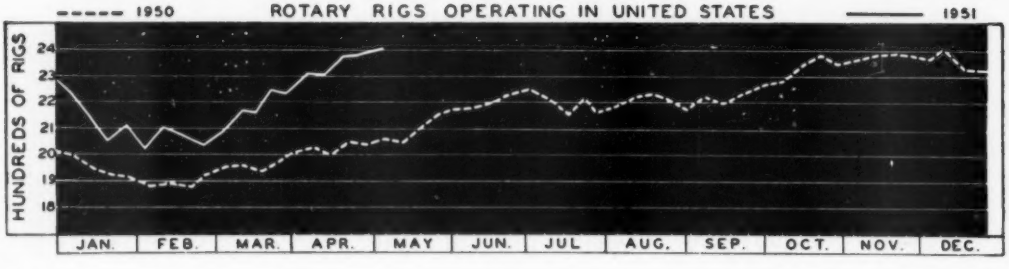
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED MAY 12, 1951

	Total of all wells					May 12		Wildcat completions and discoveries					Cumulative total, 1951				
	Comp.	Oil	Gas	Dry	Footage	1951	1950	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	10	5	0	*5	14,952	148	192	0	0	0	0	0	0	0	0	0	0
Pennsylvania	9	5	0	†4	19,454	272	359	0	0	0	0	0	0	0	0	1	1
West Virginia	10	2	4	4	26,069	202	227	0	0	0	0	0	0	0	5	2	7
Ohio	8	0	4	4	18,344	289	328	0	0	0	0	0	1	0	3	12	16
Indiana	25	6	0	19	41,821	346	420	1	0	0	11	12	9	0	1	86	96
Kentucky	30	10	5	15	57,595	309	311	1	0	0	3	4	4	0	1	48	53
Illinois	40	16	0	24	96,722	593	765	0	0	0	3	3	12	0	0	100	112
Michigan	11	1	0	10	31,588	240	277	0	0	0	7	7	7	0	4	99	110
Kansas	89	44	11	134	292,310	1,469	1,267	5	0	0	18	23	68	0	6	280	354
Nebraska	5	5	0	0	23,203	102	25	1	0	0	0	1	3	0	1	47	51
Oklahoma	126	73	8	§45	466,017	1,986	1,875	1	0	3	18	22	71	1	11	262	345
Texas	326	202	10	114	1,463,811	5,860	5,681	11	1	4	78	94	248	23	39	1,119	1,429
North Central (Dist. 7-B & 9)	103	46	0	57	287,295	1,783	1,767	6	0	0	35	41	126	0	5	478	609
West (Dist. 7-C & 8)	99	82	0	17	559,325	1,804	1,664	3	1	1	14	19	47	7	2	223	279
Panhandle (Dist. 10)	12	6	5	1	35,411	253	364	0	0	0	0	0	0	0	0	11	11
Eastern (Dist. 5, 6, & 6-P)	21	10	0	11	96,600	407	399	0	0	0	7	7	2	3	0	77	82
Gulf Coast (Dist. 2 & 3)	54	40	3	11	283,235	815	774	2	0	3	8	13	41	9	26	152	228
Southwest (Dist. 1 & 4)	37	18	2	17	201,945	798	720	0	0	0	14	14	32	4	6	178	220
Louisiana	31	12	3	16	213,464	704	857	1	0	0	4	5	18	0	4	93	115
Northern	12	6	2	4	44,703	345	441	1	0	0	2	3	5	0	3	48	56
Southern	19	6	1	12	168,761	359	416	0	0	0	2	2	13	0	1	45	59
Arkansas	3	2	0	1	11,365	133	131	0	0	0	1	1	3	0	1	27	31
Mississippi	8	5	0	3	49,206	92	121	1	0	0	2	3	5	3	0	33	41
Southeastern States	0	0	0	0	0	28	22	0	0	0	0	0	0	0	0	11	11
Montana	1	0	0	1	3,155	72	49	0	0	0	1	1	0	0	0	20	20
Wyoming	10	6	0	4	54,403	239	193	0	0	0	3	3	4	0	0	38	42
Colorado-Utah	4	3	0	1	20,411	90	22	0	0	0	1	1	2	0	2	43	47
New Mexico	20	12	1	7	114,869	239	244	2	0	0	3	5	7	0	5	27	39
California	42	33	0	9	162,970	725	602	1	0	0	7	8	17	0	1	145	163
Miscellaneous (Md.)	2	0	2	0	7,395	17	6	0	0	2	0	2	0	0	9	7	16
Total United States	810	442	48	320	3,189,124	14,155	13,981	25	1	9	160	195	479	27	93	2,500	3,099
Total previous week	783	389	40	354	3,023,025			32	0	4	164	200	454	26	84	2,340	2,904
Total May 12, 1950	842	470	58	314	3,084,065			27	2	1	114	144	354	26	73	2,063	2,516

Service wells included: *5, †1, 12, §3.





DAILY AVERAGE PRODUCTION FOR WEEK

	May 12 crude oil	B. of M. May demand	May 5 crude oil
Alabama	2,700	2,400	3,050
Arkansas	77,750	84,000	77,850
California	965,800	970,000	964,700
Colorado	78,100	78,000	79,800
Eastern	61,000	64,000	58,300
Florida	1,650	1,600	1,675
Illinois	168,900	163,000	166,400
Indiana	28,800	30,000	29,300
Kansas	308,050	303,000	317,200
Kentucky	26,700	30,000	26,800
Louisiana	610,975	632,000	610,600
North Louisiana	114,950		114,900
South Louisiana	496,025		495,700
Michigan	40,900	42,000	39,900
Mississippi	98,650	106,000	98,350
Montana	24,800	24,000	25,100
Nebraska	7,700	10,000	9,250
New Mexico	142,800	140,000	143,100
Oklahoma	504,250	505,000	508,950
Texas	2,750,875	2,500,000	2,743,600
Dist. 1 (Southwest)	33,825		33,725
Dist. 4 (Southwest)	257,800		256,900
Dist. 2 (Gulf Coast)	165,150		164,350
Dist. 3 (Gulf Coast)	482,875		482,575
Dist. 5 (Eastern)	52,450		52,200
Dist. 6 (Eastern)	113,500		112,950
East Texas field	272,700		274,500
Dist. 7-C (West)	96,600		95,200
Dist. 8 (West)	948,350		944,800
Dist. 7-B (W. Central)	85,875		85,200
Dist. 9 (N. Central)	153,150		152,300
Dist. 10 (Panhandle)	88,600		88,900
Utah	3,600	5,000	3,600
Wyoming	203,200	180,000	200,300
Total United States	*6,107,200	5,870,000	6,107,825
Change from previous week, down	625		
Canada	116,020		63,905

Total U. S. production January 1-May 12 ..... †784,079,625 bbl.
Same period last year (crude plus cond.) ..... 656,830,435 bbl.

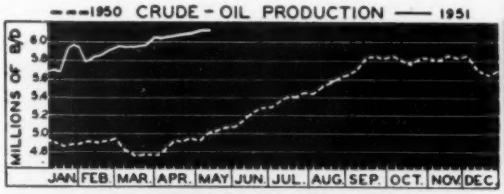
*Not including 110,105 bbl. condensate. †Including 14,169,995 bbl. condensate.

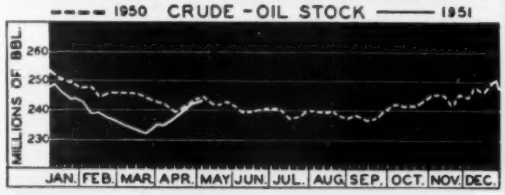
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

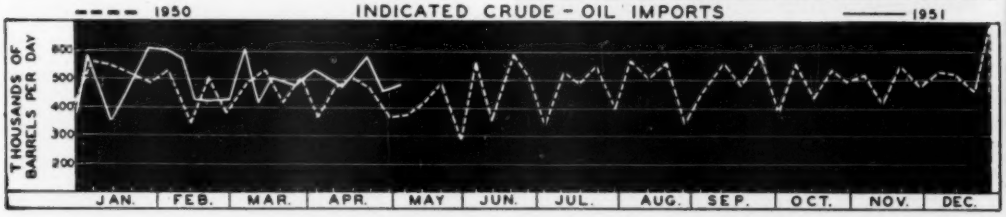
(Thousands of barrels)

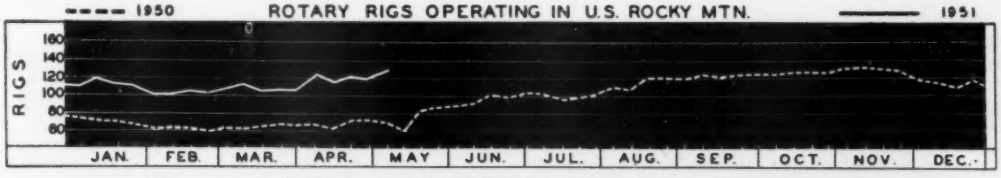
	May 5, 1951	Apr. 28, 1951	May 6, 1950
Pennsylvania Grade	2,054	2,077	2,813
Other Appalachian	1,561	1,630	1,914
Illinois, Indiana, Michigan	10,473	10,395	9,145
Arkansas	2,720	2,605	2,876
Louisiana	13,936	14,679	14,564
North	2,692	2,988	3,189
Gulf	11,244	11,691	11,375
Mississippi	3,117	3,226	2,326
New Mexico	6,908	6,975	6,232
Oklahoma and Kansas	37,940	37,251	36,189
Texas	112,326	112,437	109,560
East Texas	14,321	14,485	15,023
West Texas	44,891	45,494	39,475
Texas Gulf	25,431	24,958	27,707
Other Texas	27,683	27,500	27,355
Rocky Mountain	14,209	13,380	13,304
California	30,306	29,908	36,952
Foreign	7,475	7,916	6,588
Total	243,025	242,479	242,463

*Bureau of Mines







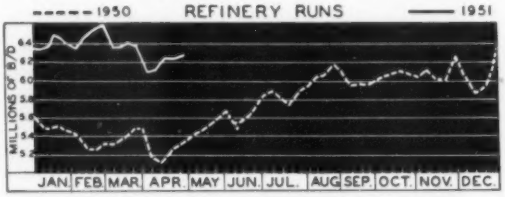


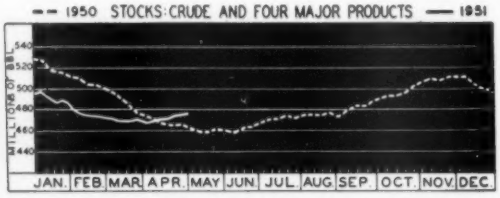
A.P.I. REFINERY REPORT, MAY 5

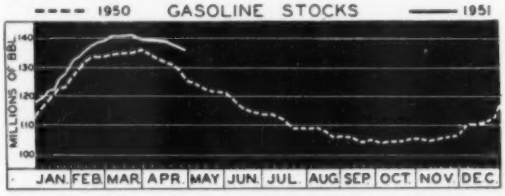
(Thousands of barrels)

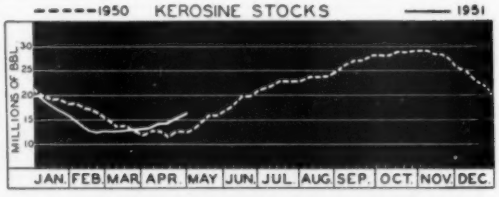
District—	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline†	Kerosine	Distillate	Residual	Bureau of Mines, May 1950: Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	1,037	369.9	45.4	213.1	236.6	26,865	6,737	13,407	8,910	928	377.5	36.2	187.7	206.2
Appalachian:														
District 1	106	42.4	7.1	11.9	10.7	2,920	304	506	246	97	41.0	6.1	12.3	11.2
District 2	82	41.0	3.6	6.4	14.4	1,410	92	188	183	73	33.9	4.6	8.1	13.9
Ind., Ill., Ky.	1,172	636.8	78.9	202.0	186.3	31,184	2,877	7,662	3,183	1,001	528.8	65.5	158.6	141.4
Okla., Kans., Mo.	472	257.7	14.6	100.3	65.4	16,031	754	5,249	1,018	495	268.0	21.5	96.3	57.7
Inland Texas	230	141.6	13.1	40.9	44.6	3,575	329	593	706	212	143.0	11.4	27.5	43.3
Texas Gulf Coast	1,472	616.4	156.9	322.3	243.3	21,372	3,103	5,740	3,928	1,155	551.8	92.6	240.8	201.4
La. Gulf Coast	493	243.0	57.6	113.8	58.1	7,073	1,620	2,156	1,359	473	231.2	55.1	93.0	57.1
N. La. and Ark.	83	29.4	8.6	18.7	8.9	2,908	245	780	72	72	25.3	7.0	13.8	12.0
Rocky Mountain:														
New Mexico	14	7.7		2.9	2.9	101	15	60	29	13	7.2	.2	2.4	3.4
Other Rocky Mtn.	191	104.9	4.3	33.7	42.6	5,553	197	1,181	641	163	76.3	4.0	31.9	30.2
California	931	412.3	6.1	141.6	366.1	16,772	529	7,725	15,815	853	363.4	11.6	125.0	285.2
May 5, 1951	6,283	2,903.1	396.1	1,207.6	1,279.9	135,764	16,802	45,247	36,095	5,535	2,647.4	315.8	997.4	1,063.0
April 28, 1951	6,236	2,839.4	385.4	1,151.6	1,249.6	137,474	15,635	43,859	36,080					
May 6, 1950	6,399	2,610.0	293.7	1,023.1	1,025.4	127,431	13,364	37,466	38,766					

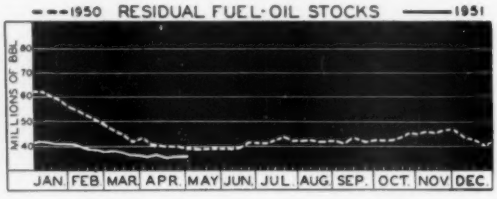
*At refineries including natural blended. †Finished and unfinished.

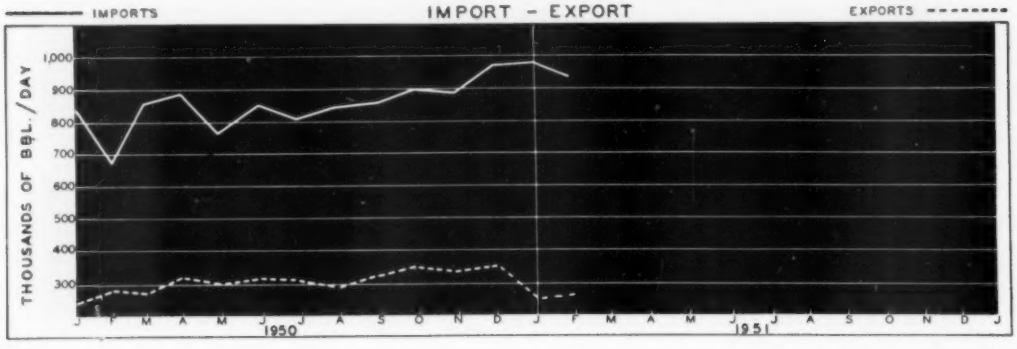












CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93			
19-19.9	1.98			
20-20.9	2.03	$2.25		$2.12
21-21.9	2.07	2.27		2.14
22-22.9	2.12	2.29		2.16
23-23.9	2.18	2.31		2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.85
Kettleman Hills, California*	2.80
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.25
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.33

*37°-37.9°. †35° and above.

HIGHER prices for cycle gasoline in the Group 3 market represent further evidence of additional strengthening of the general gasoline market. In the past, cycle-gasoline prices have been sensitive indicators of any weakness in gasoline since any drop in motor-fuel demand was first felt in the cycle-gasoline market. On the other hand, early improvement in the market for refinery gasoline often was not reflected in improved cycle prices. Unless cycle gasoline has lost some of its value as a market indicator, the recent firming of cycle prices points to marketers' plans for very high demands this summer.

Gasoline sales in the Mid-Continent continued high during the second week of May, particularly in pipeline grades.

Little improvement is reported for Group 3 sales of kerosine and distillate fuels. Demand for low-sulfur residual fuel remains above normal.

Gulf Coast and East Coast prices reached a more normal balance with the further reduction in coastwise tanker rates. Recent reports of tanker charters called for rates at the Maritime Commission base plus 25 per cent. This compares with spot rates earlier in the year of MC plus 200 per cent. At the latest rates, coastwise transportation cost for gasoline would be .975 cents a gallon. Movement of No. 2 distillate would cost about 1.13 cents a gallon.

Some tanker brokers are predicting further reduction in rates, probably to the MC base. This would permit spot sales on the New York Harbor market of material purchased at spot prices on the Gulf Coast market. Since total demand for products is lower in the summer months, commercial movement of oil during these months may be low enough to keep tanker rates down. However, any big increase in military demand tends to push rates up.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of May 14, 1951. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅛-10½	12-12.75	10¾-11
Premium gasoline, 86-88 octane	11⅛-11½	13.5-13.75	11¾-12
42-44 w.w. kerosine	9-9⅜	10	8½-9
No. 2 straw fuel oil	8⅛-8⅝	9	7½-8
No 6 residual	$1.75-1.80	$2.25-2.30	$1.75-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	29-30
200 vis., No. 3 neutral, 0-10 pp.	17.5-18.5

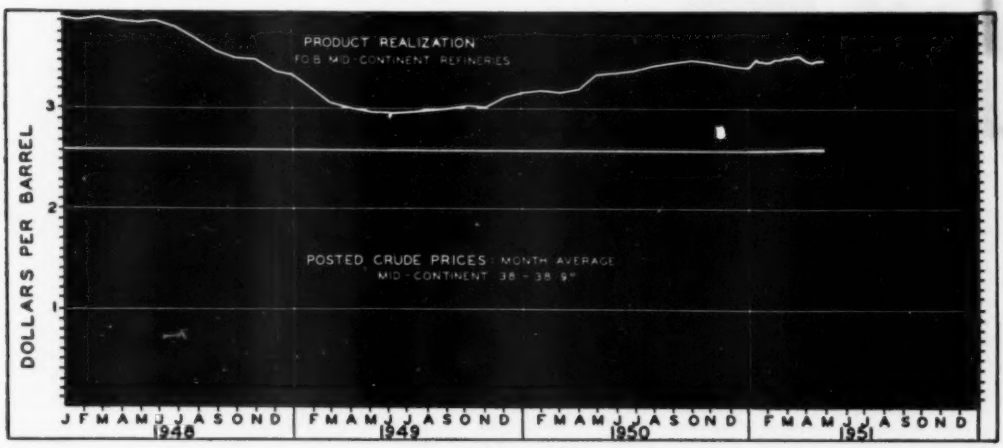
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	33.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	6.0


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38° - 38.9°
DOLLARS PER BARREL
3
2
1
J F M A M J J A S O N D
1948
F M A M J J A S O N D
1949
F M A M J J A S O N D
1950
F M A M J J A S O N D
1951

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.51 for week ended May 5, $3.50 for previous week, and $3.37 for May 1950.

EQUIPMENT MEN . . . in the News

Mid-Continent Announces Key Field Promotions

C. M. FLEEMAN

Ken W. Davis, president and general manager of Mid-Continent Supply Co., has announced the promotion of C. M. (Mac) Fleeman, district manager for Mid-Continent at Shreveport since 1949, to the position of division manager.

T. P. Tarwater, who was formerly stationed at Midland, Tex., as manager of the West Texas-New Mexico division, has been appointed as general division manager. R. M. Flippo, division machinery manager at Houston, has been promoted to manager of sales, machinery division, Fort Worth.

T. P. TARWATER

R. M. FLIPPO

W. W. ARNOLD

P. Z. HILLIARD

W. W. (Woody) Arnold, formerly district manager for the Brownfield-Snyder-Sundown area, has been named acting division manager for the West Texas-New Mexico division, Midland. P. Z. (Zack) Hilliard, for the past 6 years district manager at New Orleans, has been promoted to the position of management coordinator at Fort Worth.

J. W. Eastham has been made district manager of the Brownfield-Snyder-Sundown area; J. W. Hoover, division machinery manager at Houston; G. B. (Barney) Blair, district manager at Shreveport; R. P. (Randy) Brown, store manager at Magnolia, Ark.; W. A. (Bill) Sellers, transferred and appointed manager of the Odessa store; B. S. Harkrider, store manager of the Duncan, Okla., field store; R. E. Dunn, store manager at Sundown, Tex.; James L. Waltrip, appointed Fort Worth city salesman, and W. M. (Pete) Day, transferred to New Orleans as district manager succeeding P. Z. Hilliard.

Quaker Appoints Lewis Assistant Sales Manager

J. R. Lewis has been appointed assistant general sales manager of Quaker Rubber Corp., Philadelphia, a division of H. K. Porter Co., Inc., according to J. R. Keach, vice president and general manager.

Lewis has been with Quaker since 1940 and has advanced steadily in the organization, having held positions as Philadelphia district sales manager and assistant sales manager.

In his new position Lewis will assist the general sales manager in providing better service to Quaker's distributors and customers.

Burgess-Manning Opens Dallas Headquarters

Burgess-Manning Co., manufacturers of industrial noise-abating equipment, has recently opened engineering and sales facilities at Dallas, to serve the petroleum and chemical industries.

Over-all charge of manufacturing facilities, sales office and research laboratories is in the hands of R. L. Leadbetter, vice president of Burgess-Manning. S. G. Paddock is manager of sales and A. P. Gallagher is assistant engineer.

Aluminum Announces Three Advancements

Roy A. Hunt, president of Aluminum Co. of America since 1928, was named chairman of the executive committee and I. W. Wilson, senior vice president, was made president of the company at a recent meeting of Alcoa's board of directors. The board also elected Leon E. Hickman as vice president and general counsel, as well as director.

Hunt started with Alcoa at the New Kensington, Pa., works in 1901 as a machinist's helper. He was made president in 1928 and his 23 years as head of Alcoa has been the longest presidential tenure in the company's history.

I. W. Wilson, who has been with Alcoa 40 years, began his career with this company in 1911 at Niagara Falls, N. Y. He has been senior vice president since 1949.

Amos Roberts Made General Sales and Service Manager

AMOS ROBERTS

The appointment of Amos A. Roberts as general sales and service manager of Baroid Sales Division, National Lead Co., has been announced by General Manager George L. Ratcliffe. Roberts, formerly manager of the Mid-Continent division with headquarters in Tulsa, will move to Houston to take over his new assignment. He will supervise those divisions and departments of the Baroid Sales Division which engages in the sale and service of drilling-mud products.

Roberts joined Baroid in May 1935 as a field service engineer in the Mid-Continent division. In September 1943 he became district manager and shortly thereafter was promoted to manager of the Mid-Continent division. He remained in this capacity until his present appointment.

Roberts is a graduate of Oklahoma A. &. M. After graduation, he was employed by General Foods Sales Co., Oklahoma City, in sales and advertising. He then joined Skelly Oil Co. and a few years later was employed by Texaco Salt Products Co., Tulsa, as a chemist. After working in the oil fields for contractor Thomas Dietle, Pawhuska, he joined Barnsdall Refining Co. as a chemist, which he left to join Baroid in 1935.

Continental Supply Co. Names Store Managers

Continental Supply Co. has announced that C. K. Trease, formerly field salesman at Oklahoma City, has been made store manager at the same location. William B. Holloway, formerly bookkeeper at Perry, Okla., has been transferred to Pratt, Kans., as store manager.

Spicer to Join Empire Machinery at Tulsa

Empire Machinery Co., Ltd., Odessa, Tex., has announced the appointment of E. E. Spicer to its Tulsa office. He was formerly with General Motors in Tulsa, and more recently with Diesel Equipment Co. of Great Bend, Kans.

Spicer sold his interest in Diesel Equipment Co. and since March 1 has been associated with Empire.

Wagner-Morehouse Opens New Los Angeles Plant

The new modern manufacturing plant of Wagner-Morehouse, Inc., at Los Angeles.

Wagner-Morehouse, Inc., organized in 1936, recently celebrated its fifteenth anniversary as a producer of "Streamline" oil-well drilling and servicing equipment. Charles D. Wagner, president, and Harry C. Morehouse, vice president, have wide experience in oil-field engineering and manufacturing activities.

The new plant occupies 2 acres of ground in the industrial section of East Los Angeles, and an area of approximately 50,000 sq. ft. is provided for the fabrication of derricks, portable rigs, and structural work. The machine and assembly department incorporates modern steel construction and equipment throughout, consisting of about 10,000 sq. ft. of floor space, with an attractive two-story building fronting the property and housing the general offices and engineering departments.

Hagen Joins R/M West Coast Sales Division

Raybestos-Manhattan, Inc., has announced that P. H. Hagen, of Seattle, has joined its West Coast sales division to handle the sale of Manhattan mechanical rubber products and R/M packings in the Pacific Northwest with headquarters in Seattle.

Hagen will be attached to the West Coast sales division, which has its principal office in San Francisco, in charge of Littleton C. Barkley, Pacific Coast sales manager.

Strang Appointed SKF Advertising Manager

Norman A. Strang has been appointed advertising manager of SKF Industries, Inc., as announced by Robert R. Zisette, general sales manager. He succeeds Robert C. Byler, recently deceased.

Strang joined SKF as a sales clerk in 1940, later supervising the preparation and production of direct mail, catalogs, and other sales-promotion matter. In 1947 he was made sales-promotion writer, and in May 1950 was appointed assistant advertising manager.

Gallman Transferred to New Sales Post by W-K-M Co.

V. C. Gallman, former district representative for W-K-M Co. at Tulsa, has been transferred to Houston as general sales representative.

Gallman will supplement W-K-M's representation in Houston and will also represent the company in the interest of pipe-line sales in the central United States district.

Westinghouse Holds Annual Stockholders' Meeting

Five directors of Westinghouse Electric Corp. were reelected at the recent annual meeting of the company's stockholders held at Bloomfield, N. J.

Four of the directors, reelected to 4-year terms, were: Winthrop W. Aldrich, chairman of the board, Chase National Bank of the City of New York; Frank R. Denton, vice chairman, Mellon National Bank & Trust Co., Pittsburgh; John L. Hall, senior member of the law firm of Choate, Hall & Stewart, Boston, and Thomas I. Parkinson, president, The Equitable Life Assurance Society of the United States, New York.

E. V. Huggins, secretary of Westinghouse, was elected a director of the company for a 1-year term.

Thomas Elected President Of Monsanto Chemical

Dr. Charles Allen Thomas, one of the nation's leading atomic scientists, has been elected president of Monsanto Chemical Co., replacing William M. Rand, recently retired.

Dr. Thomas, who has been Monsanto's executive vice president since 1947, began his industrial career with General Motors, aiding in the development of ethyl gasoline and later established research laboratories in Dayton. The laboratories were acquired by Monsanto in 1936 and Dr. Thomas became the company's research director.

Graham Leaves Industrial Advertising Firm

The former partnership of Dozier-Graham-Eastman, Los Angeles advertising firm, has been altered, with Graham leaving to form his own agency. Dozier and Eastman will continue to keep the former organization intact.

This firm is now known as Dozier, Eastman & Co., and other than Graham's no longer being connected with the company, no other changes are being made.

Fluid Controls Represents American Car & Foundry

The valve division of American Car & Foundry Co. has appointed Fluid Controls Co., Inc., Philadelphia, as its representative in the sale and servicing of A.C.F. valves, for Delaware, eastern Pennsylvania, and in the western part of New Jersey.

Fluid Controls specializes in industrial control problems and control valves.

Colville Made Advertising Manager by Byron Jackson

Theodore R. Colville has been appointed manager of all advertising and sales promotional activities for Byron Jackson Co. His duties include all four divisions.

Colville became affiliated with B-J in 1948. He was formerly associated with General Electric Co. in Schenectady, N. Y., engaged in the advertising activities of its chemical department.

Bent to Head Industrial Division for Westinghouse

The appointment of A. J. Bent as director, industrial products division, has been announced by Westinghouse Air Brake Co., Wilmerding, Pa. Bent, formerly field sales manager of the division, will direct manufacturing, sales, and marketing activities of the company's air compressors and pneumatic controls in the automotive, oil rig, aircraft, and industrial fields. His headquarters will be in Wilmerding.

H. W. McCracken, formerly district

representative in New York, succeeds to Bent's former position as field sales manager, and E. W. Kidd, formerly representative in the Boston office, assumes charge, with the same title, of the eastern district in New York.

Fluor Corp. Announces Three Promotions

Robert L. Merrick, former manager of engineering, has been appointed manager of engineering and construction, according to D. W. Darnell, president of Fluor Corp., Ltd., Los Angeles constructors and engineers. Merrick is a graduate of Armour Institute of Technology.

R. L. MERRICK

F. G. CRAWFORD

John Marshall has been made manager of engineering. A graduate of Colorado School of Mines, Marshall prior to his promotion was chief mechanical engineer for Fluor.

JOHN MARSHALL

Frank G. Crawford has assumed the duties of chief mechanical engineer. He is a graduate of California Institute of Technology. Prior to coming to Fluor he was associated with Union Oil Co.

Broderick & Bascom Opens Factory in Houston

Recognizing the rapid growth of industry in the South and Southwest and anticipating its further expansion, Broderick & Bascom Rope Co. has built a wire-rope factory in Houston. This factory covers 34,000 sq. ft. of floor space and is equipped with the latest machinery.

Complete equipment has been installed for making oil-field ropes, such as rotary and cable-tool drilling lines, workover and sand lines, as well as other special ropes required in the oil industry.

Laurence R. Saunders, who managed the company's Houston district sales office, has been appointed manager of an enlarged sales territory to be served by the Houston plant. Wilmer H. Wheeler is plant superindentent.

Totco Announces Personnel Changes

Returning from an extended trip to the Mid-Continent area, H. H. (Pete) Peters, vice president of Technical Oil Tool Corp., announced several personnel changes.

H. H. PETERS

Bob Green, formerly stationed at Casper, Wyo., recently moved to Los Angeles as field testing engineer. Eldon Snyder, formerly of Brookhaven, Miss., has been assigned to Green's former territory at Casper.

Howard Reed, formerly in Houston, was appointed to serve Totco in the Laurel, Miss., area. W. D. Smith joined the Totco organization at Houston and was assigned to the territory vacated by Reed.

Geophysical Firm to Erect 140-Ft. Masonry Building

General Geophysical Co. has commissioned Zimmerman & Bible, architects and engineers, to prepare plans and specifications for a 140-ft. masonry building with two 100-ft. wings to be erected on a 3½-acre site in Houston.

Earle W. Johnson, president of the company, which operates throughout the United States and western Canada, is negotiating a contract for the construction of the new building to serve as a laboratory and shop building.

Miller, Wilson Leave for World Petroleum Congress

Jack Long, assistant general manager of Oil Base, Inc., was on hand at the Los Angeles International Airport to wish Doyne Wilson and George Miller a pleasant journey to the Third World Petroleum Congress to be held at The Hague. Miller, president of Oil Base, has prepared a paper for the congress on oil-base drilling fluids. Wilson, director of research at Oil Base, will also give a paper on oil-emulsion muds.

LEGAL

Notice is hereby given that SEALED BIDS will be received until 2:00 p.m. May 31, 1951 and opened at that time in the Office of the Superintendent of the Wind River Indian Agency, Fort Washakie, Wyoming for the leasing of the attached units of tribal land located in Fremont County, Wyoming for oil and gas mining purposes, totaling 27,876.38 acres more or less as surveyed. UNIT NO. 1: SE¼ NW¼, S½ NE¼, E½ SW¼, SE¼, Section 9, S½ N½, S½ Section 10, S½ NW¼, S½ Section 11, All Section 13, All of Section 14, All of Section 15, E½, E½ W½, Section 16, NE¼, E½ SE¼, Section 21, All of Section 22, N½ N½, SE¼ NE¼, S½, and undivided ½ interest in the S½ NW¼, and SW¼ NE¼, Section 23, S½, and an undivided ½ interest in the N½, Section 24, All of Section 25, All of Section 26, E½ NW¼, NE¼, E½ SE¼, Section 27, all in Township 5 North, Range 1 West, W.R.M., W½ SW¼, Section 17, W½ NE¼, SE¼ NE¼, W½, SE¼, Section 18, All of Section 19, W½ Section 20, All of Section 30, all in Township 5 North, Range 1 East, W.R.M. UNIT NO. 2: SW¼, Section 2, W½ SE¼, Section 3, All of Section 4, All of Section 5, E½, SW¼, Section 6, All of Section 7, All of Section 8, All of Section 9, All of Section 10, W½ NE¼, W½, SE¼, Section 11, S½, Section 12, N½, SW¼, Section 13, All of Section 14, All of Section 15, All of Section 16, E½, NW¼, E½ SW¼, Section 17, NE¼ NE¼, Section 18, NE¼, Section 20, N½, Section 21, N½ Section 22, all in Township 5 North, Range 1 East, W.R.M. UNIT NO. 3: SE¼, Section 20, S½, Section 21, SW¼, Section 22, All of Section 27, All of Section 28, E½, NW¼, N½ SW¼, Section 29, E½, Section 31, All of Section 32, N½, Section 33, All of Section 34, W½, Section 35, all in Township 5 North, Range 1 East, W.R.M. W½, Section 2, All of Section 3, All of Section 4, All of Section 5, E½, Section 6, NW¼, E½, Section 8, All of Section 9, N½, Section 10, all in Township 4 North, Range 1 East., W.R.M. The foregoing units of tribal land is being offered, and a lease will be drawn on the applicable Government form. The right is reserved to reject any and all bids. The successful bidder will be required to pay the cost of advertising. The lessee must pay as advance rental $1.25 per acre per annum. The lease will be sold to the highest bidder for a bonus offer upon an acreage basis in addition to the royalty of 12½%. The successful bidder must deposit with the Superintendent of the Wind River Indian Agency, on the date of the sale, a certified check or draft on a solvent bank in an amount equal to 20% of the bonus bid and of the first year's rental, as a guaranty of good faith. The check is to be made payable to the TREASURER OF THE UNITED STATES. The lease must be completed and filed with the Superintendent within 20 days from the date it is received by the lessee for execution and returned with the remainder of the bonus bid, the balance of the first year's rental, a filing fee of $10.00, and the cost of the printed forms. Failure in any of these conditions may subject the bid to cancellation without further notice and forfeiture of payments already made. The lease on the above tribal unit will be drawn pursuant to the Act of May 11, 1938 (52 Stat. 347) and the regulations, Part 186, Title 25, C.F.R. The lease issued pursuant to this notice will be made for a term of ten years from the date of approval by the Commissioner of Indian Affairs and as long thereafter as oil and/or gas is produced in paying quantities. The rate of royalty will be 12½% of the value of all oil, gas, and/or natural gasoline, unless the lessor, with the approval of the Commissioner of Indian Affairs, elects to take royalty in kind. The successful bidder for each unit will be required within one year from the approval of the lease or leases issued therefor to commence the drilling of a test well at some location on the lands included in the unit and diligently drill same to a minimum depth of 8,000 feet or to a depth sufficient to adequately test the Tensleep formation unless oil or gas is found in commercial quantities at a lesser depth or the Geological Survey shall determine that further drilling in the well is not warranted. The adequacy of the bonus offer will be determined by the U. S. Geological Survey. A suitable bond will be required, and such bond must be approved by the Commissioner of Indian Affairs. The responsibility of complying with any requirements of the Federal Documentary Stamp Statutes will be left with the successful lessee. All bids should be addressed to the "Superintendent, Wind River Indian Agency, Fort Washakie, Wyoming" in a plain envelope marked: BID FOR OIL AND GAS MINING LEASE, LITTLE DOME FIELD, TO BE OPENED AT 2:00 P.M. MAY 31, 1951. For further information call or write Lands Department of the Wind River Agency. Lynn W. Jenkins, Land Officer.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES, E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-8407.

ONE Landis Model-27 crank shaft grinder, size 20" swing by 72" centers with 30" diameter grinding wheel and individual motor drive. Like new condition—Bargain! Acme Screw Products Co., 1537 East 7th St., Tulsa, Oklahoma. Phone 2-5477.

90 HP Direct Driven Superiors. Extra cylinders, 80 HP C & G Coopers. Location Oklahoma. Alfred B. Kern, 223 Wright Bldg., Tulsa, Oklahoma.

1600 ft. 10¾" OD 45.5# J-55 8RT R2 No. 1 Used Seamless Casing available about 4/5 weeks.

2500 ft. New 10¾" OD 8 ga. Spiral Weld Surface Casing Plain End Couplings. May delivery.

FRANK MORRIS & COMPANY
TUBULAR PRODUCTS
424 So. Cheyenne, Tulsa, Okla. 2-8247

FOR SALE
SEAMLESS OIL WELL CASING
4,000′ of 7" OD Seamless Casing, 8 Round Thread, Range 2.
2,000′ of 8⅝" OD 24# Seamless Casing, 8 Round Thread, Range 1 & 2.
1,000′ of 10¾" OD 32¾# Seamless Steel Casing.
600′ of 13⅜′ OD 48# Seamless Steel Casing.
Above casing was bought new last year
NORRIS-MADISON SUPPLY CO.
Glasgow, Ky. Phone 406

FOR SALE

New at East Chicago, Indiana, 3 BS&B Catalytic Converters Complete, 4′ ID x 28′ Ser. #2856T1, 2 and 3, Shells ½" thick ASTM—A 70 Flg. quality steel, Tube Sheets 10¼" Thick same steel, cover plates 7⅜" thick ASTM—A 212 Fire Box quality, 48—5" OD x 28′ x ⅜" Seamless Tubes A-106-39 Grade "B", Shell Design Pressure 60# PSIG, Test 90#. Tubes and Heads 1100# PSIG, Test 1650#. Full data and price on request.

CITIES SERVICE OIL
Patridge, Bartlesville, Oklahoma

FOR SALE
ROD and TUBE STRAIGHTENER
#4 SUTTON-ABRAMSON
10½ Cap. Tubes—6" Solids
Five Roll Top Drive,
Idlers Timken Bearing

LURIA BROTHERS & CO., INC.
Lincoln-Liberty Building
Phila. 7, Pa. RIttenhouse 6-7455

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

FOR SALE: At Madison, Kansas, 1—Model FS-35 Cardwell Skid Type Oil Field Servicing Unit, $750.00. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOREIGN SEAMLESS CASING
A. P. I. Specifications. Subject to letter of credit. Box D-981, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPE FOR SALE

F.O.B. Mt. Pleasant, Michigan:
1600′ J-55 5½" O.D., 14# 8 R.T., R.1
1500′ J-55 5½" O.D., 14# 8 R.T., R.2
(In dry hole less than week. Like new)

F.O.B. Fennville, Michigan:
1300′ New H-40 5½" O.D. 14# 8 R.T., R.2
2200′ A-1 Used 5½" O.D. H-40 14# 8 R.T., R.2
1000′ A-1 Used 5½" O.D. J-55 15½# 8 R.T., R.1

F.O.B. Grand Rapids, Mich.:
6000′ A-1 Used Grade C 5½" O.D. 14# 10 V.T., R.1 & 2. (Excellent condition—attractively priced).

MICHIGAN CARLON PIPE CO.
20120 Livernois Avenue, Detroit 21, Mich.
Diamond 1-1400

EQUIPMENT FOR SALE

2—Identical Electric Machinery Manufacturing Company Generators, 60 KVA, 40 KW, 480V, 60 AMP, 1200 RPM, 3 Phase, 60 Cycle, each powered by a Buda Model L525 natural gas or gasoline engine and each cooled by a Young Happy Model 38 Full Flow Engine Jacket Water Cooler. Horsting Oil Company, P. O. 388, Driscoll, Texas.

FOR SALE
LOW PRESSURE GASOLINE PLANT
(Complete)

80 hp. Clark Engines
Fractionators — Scrubber tanks
Stills — Boilers
Cooling Towers — Buildings
Storage Tanks — Houses and Land
Worthington 2-stage compressors —Belt Driven
All types of equipment pertaining to gasoline plant.
Located near Depew, Oklahoma
For further information contact

Bankoff Pipe & Supply Co.
823 N. Lewis Phone 6-2119
Tulsa, Oklahoma

PRICED RIGHT
OILWELL CASING AND TUBING

Texas area	St. Louis area	Description		
21,000′		2⅜"OD	3.65#	Used Lapweld T&C Line Pipe, 11½ V-Thread.
	5,100′	2⅜"OD	4#	Used Lapweld T&C Tubing, Range 1, 11½ V-Thread.
20,000′	14,000′	2⅜"OD	4.6#	Once-Run J-55, Range 2, T&C Tubing, 10 Rd. Thread.
11,517′		2⅜"OD	4.6#	Used Seamless Range 2 T&C Tubing, 11½ V-Thread.
	6,200′	2⅜"OD	4.6#	Used Lapweld Range 1 T&C Tubing, 11½ V-Thread.
11,046′	1,360′	5½"OD	14#	Used Lapweld Range 1 T&C Casing, 11½ V-Thread.
4,590′	760′	5½"OD	15#	Used Lapweld Range 1 T&C Casing, 11½ V-Thread.
3,998′		5½"OD	17#	Used Lapweld Range 1 T&C Casing, 11½ V-Thread.
1,022′		6" OD	18#	Once-Run Seamless Range 2 T&C Casing, 8 Rd. Thd.
1,899′		6" OD	20#	Once-Run Seamless Range 1-2 T&C Casing, 8 Rd. Thd.
12,000′	3,000′	7" OD	17#	Used Lapweld Range 1 T&C Casing, 10 V-Thread.
3,000′		7" OD	20#	Used Lapweld Range 1 T&C Casing, 10 V-Thread.
1,700′		7" OD	24#	Used Seamless Range 1 T&C Casing, 10 V-Thread.
227′		7⅝"OD	26#	Once-Run Seamless Range 1-2-3 T&C Casing, 10 V-Thread.

SUBJECT TO PRIOR SALE

OTHER SIZES NEW AND USED CASING, TUBING, LINE PIPE AND SEAMLESS TUBING . . . MANY SIZES SUITABLE FOR GAS, OIL, WATER FLOW LINES
FOR FULL DETAILS, WIRE OR PHONE AT ONCE

A. J. STRUBEL, Broker
SIDney 1791 (Day Phone) HUDson 8152 (Night Phone) 4946 Murdoch, St. Louis, Mo.

EQUIPMENT FOR SALE

EVERYTHING in Cable Drilling Tools, Rigs—Belts—Tanks—Engines. 23 Complete strings heavy tools. Tri State Tool & Supply Co., Box 827, Phone 7-5121, Parkersburg, W. Va.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 152—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

NEW OIL WELL CASING

Now offering the following sizes, subject to prior sale:

5½"—7"—8⅝"—9⅝"

Box D-979, The Oil and Gas Journal
Tulsa, Oklahoma

We offer for immediate delivery

OIL REFINERY EQUIPT.

AT LIQUIDATION PRICES!

Worthington and Gardner-Denver STEAM PUMPS

Southwestern

Exchangers and Condensers

TOWERS—VESSELS—STILLS

PIPE—VALVES—FITTINGS

70,000 bbls. Assorted Tankage

Complete ETHYL Treater in Excellent Condition. Recently Cleaned and Inspected.

For further information, phone/write/wire

Dulien Steel Products, Inc., of Calif.

11611 S. Alameda, Los Angeles, Calif.
Phone: LOrain 6-2108

EQUIPMENT FOR SALE

FOR SALE—At Bartlesville, 1—Standard Six Unit Todd Check Signer with Stacker, $150.00. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: Approximately 500'—13# O.D. Seamless Casing and 200'—13" O.D. Lapweld Casing $4.50 per foot. Located near Falls City, Nebraska. Contact Herman Sill, White City Motel, Falls City, Nebraska.

NATIONAL #3A6 Drilling Machine practically new—complete with A-1 string of tools and Superior Diesel Engine, all housing and timbers, new steel band wheel, 72' mast with cushion top—priced for immediate sale only $8000.00 F.O.B. Mt. Pleasant—Evaluation and Sales Service. Box 30 Mt. Pleasant, Michigan.

FOR SALE—TANKS

2—80,000 bbl. Tanks, Hominy, Oklahoma.
2—55,000 bbl. Tanks, Maud, Oklahoma.
All Steel—will cut down, match mark load on cars.

W. C. BERRY
Phone 3-6141, Tulsa, Oklahoma

IMMEDIATE SHIPMENT

STEEL PRESSURE VESSELS

16,000 gal., 8'x45'x¾", 150 PSI, ASME, WELDED (4).
8,200 gal., 6'x40'x2", 300 PSI, riveted (2).
3,500 gal., 5'x24'x¾", 200 PSI, riveted (5).

TANKS

3,000 gal., 5'x21'x¼", type 430 SS.
6,500 gal., 6'4"x27'10" TANK CAR TANKS (30).
13,500 gal., 10'x21'6"x1".
15,300 gal., 9' x 32' x ⅜".
16,200 gal., 10'6"x25'x¼".

TOWERS

36" x 11' Haveg.
24" x 94", rubber lined.
20" x 63" steel.
72" x 29'8" SS Bubble Cap.
5' x 43' steel Bubble Cap.
6' x 44' Scrubber, steel.

NEW PUMPS

DAYTON-DOWD, CENTRIFUGAL (25).
ECONOMY—VSL 2½ (9).
ECONOMY—CS-2½, turbine drive (2).
ECONOMY—MF, turbine drive (1).

MISCELLANEOUS

NEW TEFC & XP MOTORS
DIESEL GENERATORS—100 KW, Worthington, 3/60/440 (4).
FANS & BLOWERS
REDUCERS—All sizes & ratios.
WELDERS—300 & 400 amps, Hobart.

WRITE FOR OUR BROCHURE

HEAT & POWER CO., INC.
70 PINE ST., N. Y. 5 **DIGBY 8-0373**

EQUIPMENT FOR SALE

IMMEDIATE delivery complete workover Jack Knife Rig. Details and price on application. P. O. Box 3246, Corpus Christi, Tex.

WAR SURPLUS EQUIPMENT

2½ to 25 Kw Light Plants, Byron Jackson Pump Units, Gaso Pump Units, Hale Fire Pump Units, Stewart-Warner Heater Units, Benson Portable Power Hoist, Victaulic Pipe Couplings & Fittings, Mobilift Forklift Trucks, New Wheatley 4" & 6" Gate Valves 500 WP. Write for listing—H. A. McCarthy, 310 Thompson Bldg., Tulsa, Oklahoma. 5-3296.

SULLIVAN 200, mounted on Mack tandem truck, 45 foot mast, 5 X 8 Gardner-Denver pump, Rig powered by two Industrial 12 Chrysler engines 140 hp. each, vee belt drives, automatic chuck, hydraulic pull down, 26 foot Kelly, swivel, hoses, breakout tongs, and many other tools including about 1000 feet of drill pipe. Rig had $8000.00 in new parts put in it recently. Excellent condition. $15,000.00. Now operating in eastern Nebraska. Omaha Drilling Co., 624 Service Life Bldg., Omaha, Nebraska.

FOR SALE: 1 RL Cardwell, double drum, with four-legged mast. In good working condition, now working. Box 871, Seminole, Oklahoma.

WELL EQUIPMENT: New and used spudders, rotaries, core drills—all sizes and types. Cable tools, drill pipe, bits, pipe. Fishing tools. Everything for Well Service. Pressey & Son, Pueblo, Colorado.

FOR SALE: 2400 foot Rotary Rig complete with mast and Int. Truck, 2443 ft. 4½" drill pipe. L. O. Moore, 1010 East Main or Phone 1042, Holdenville, Oklahoma.

FOR SALE — Bucyrus-Erie Model 28-L Spudder, equipped with dual-tired semi-trailer mounting, casing tackle strut, tool crane, Waukesha gas-gasoline engine Model 6MZA. Machine complete with drilling tools, small tools, casing tools, good drilling, sand, and casing lines, flooring, section house, light plant, etc.—Price $15,000. Complete inventory furnished on request. J. W. Lang Co., 162 West 12th St., Holland, Michigan.

PIPE LINE EQUIPMENT FOR SALE

1—Buckeye Wheel Trencher, Model #12. Just rebuilt. Buda Gasoline Motor.
1—Buckeye Wheel Trencher, Model #12. A1 condition. Caterpillar Diesel Motor.
1—TD14 Angledozer. Rebuilt. Good Condition. With Tail Winch.
Various 200 and 300 Amp Gasoline driven welding machines.

Harford Brothers Construction Co.
Post Office Box 191, Emporium, Pa.

SAVE on TOOL JOINTS

- **NEW**
- **CURRENT** ***They won't last long.***
- **TOP QUALITY**

258 3½" API Regular Rotary Tool Joints, oversize 4⅝" OD Special 2" bore, 2 9/16" x 3½"—5 thread box and pin, Beveled for welding, for use with 3½" OD Internal Upset API Drill Pipe. **Price $29.50 per set.**

18 5 9/16" API Full Hole Joints 7" Standard OD 4" Bore, API Beveled for Welding, 5" x 5 13/16"—5 thread box and pin, for use with 5 9/16" Internal Upset Drill Pipe. **Price $53.00 per set.**

Contact your supply store

HINDERLITER TOOL COMPANY DIVISION

H. K. PORTER COMPANY, INC.

Drawer 2650 **Tulsa, Okla.**

FOR SALE
Cast Iron Pipe

Quantity	Size	B & S	Class
2,000'	24"	do	150
1,500'	18"	do	200
2,160'	14"	do	200
454'	12"	do	200
288'	10"	do	200
625'	8"	P.E.	150
123'	8"	FLG	150
351'	6"	P.E.	150

400 Tons

Cast Iron Valves & Fittings

Steel Pipe

5,700'—26" O. C. x .312 Wall
85.55 16/Ft.—D.R.L.

Write—Wire—Phone

Brown-Strauss Corp.

1546 Guinotte, Kansas City 10, Mo.
Phone: HA. 1000

EQUIPMENT FOR SALE

FOR SALE: At Barnsdall, Oklahoma, 1—Used 10" x 4½" x 10" Chicago Pneumatic belt driven compressor 500# operating pressure, 275,000 CPD, Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: Three Model 1879 used Buda engines at bargain prices. Worth your investigation for parts or rebuild. Carson Machine & Supply Co., Oklahoma City, Oklahoma. Phone 6-1511.

CASING PULLING CONTRACTORS with Hydraulic Equipment: Experienced operators—Pull any size pipe, anywhere. Also will buy wells for salvage. GENERAL CASING PULLING CO., P.O. Box 4387, Oklahoma City. Phone 6-1335.

FOR SALE: 4—80 HP Bessemer Gas Engines, 2—50 HP Bessemer Gas Engines, 2—40 HP Superior Gas Engines. Also 5, 10, 15, and 30 HP GE Electric Motors; 1—17" x 12" Ingersoll-Rand Duplex Vacuum Pump; 1—20" x 12" Ingersoll-Rand Duplex Vacuum Pump. For information and prices contact W. W. Teer, Wichita Falls, Texas, Phone 2-1821.

FOR SALE—Mayhew Model 2000'—1 Year old. A-1 Condition—mounted on International Tandem—5 x 8 G-D Pump—2000' 2⅞" drill pipe, drill collars, core barrel, International winch truck, trailer mounted dog house, water tank, light plant, water pump, misc. tools; Rig now working in Oklahoma. Contracts available. Box E-113, The Oil and Gas Journal, Tulsa, Oklahoma.

APPROX. 20 tons of the following pipe couplings which are used, and have "Dutchmen": 4" (4½" O.D.) 8 thrd recessed—std & API couplings, wght approx 10# ea w/d 4" and 4⅝" lgths. 6" (6⅝" O.D.) 8 thrd—recessed—couplings wght approx 20# ea w/d 5" & 6" lgths. 6" (6⅝" O.D.) 8 thrd—recessed—Casing Couplings wght approx 30# ea w/d 7" lgths. Arkansas Pipe & Supply Co., Phone: 3-7320, El Dorado, Arkansas.

FOR SALE: Ideal slush pump, Model C-150. Melton Supply Company, Seminole, Oklahoma.

A REBUILT Keystone Spudder, trailer mounted, truck and tools. J. M. Berry, 239 South Pine, Phone 996, Nowata, Oklahoma.

FOR SALE: Failing 1500, Buda engine, 38 foot mast, mounted on 6x6 truck, complete with drill rod and accessories, operating and in good condition. H. W. Peerson Drilling Co., 1114 Seventh Avenue South, Birmingham, Alabama.

HOT BUY—8" COLLARS

28 lb. line pipe couplings at Dallas, Oilton Pipe & Supply Co., Oilton, Okla.

TWO 125HP Babcock Wilcox marine type boilers including 52'x40' heavy iron sectional gabled boiler house, piping and pumps. Everything in place. Very reasonable. Box 533, Casper, Wyoming.

BUCYRUS 24 W, Waukesha engine, mounted on International 2½ ton truck. Drilling and fishing tools, cables. S. W. Pressey & Son, Pueblo, Colorado.

FRANKLIN Valveless 15x15 Gas engine 65 HP $500, Worthington 18 x 4½ x 12 Compressor $1000, Bessemer 9 x 4½ x 10 Compressor $1000, 20 HP Olin Gas engine $250, 5000 gal. Horizontal Gasoline storage tank $400, Pumping powers & other equipment on leases we are abandoning near Titusville. The B. Levy Estate, Titusville, Penna.

FOR SALE or interest in production: 834' 8⅝" 24# J-55 Seamless; 3172' 7" OD 20# Seamless, Range 2. All new condition. J. E. Cunningham, 1625 38th N.W., Canton, Ohio. Phone 4-9645.

FOR SALE: 20,000' 4" o.d. 6 lb., seamless line pipe. Random lengths 30' to 35'. This is number one used pipe. Clean, straight, beveled, ready to lay. Price 75c our yard. M. J. Regan, Coffeyville, Kans.

FOR SALE

SUGAR CURED COUNTRY HAMS

Aged and guaranteed.

15 to 20 lbs. Hickory smoked — $1.15, sassafras smoked — $1.35 per lb. f.o.b. C.O.D.

SOURWOOD MOUNTAIN FARMS

Sunbright, Tennessee

EQUIPMENT WANTED

WANTED: PORTABLE ROTARY Complete, fair condition, 4,000' Cap. Box 198, Gorham, Kansas.

WANTED: Good used well drilling equipment. Spudders, rotaries, large or small. Tools and general equipment. We distribute throughout the West with hundreds of customers. Pressey & Son, Pueblo, Colorado.

OCS GREYHOUND Chain Driven Sand Reel, Heavy Cable Tool Rigs; Side Door Elevators; Control Heads, Spudders, Skid Type Pulling Units. McGinnis, Tri State Gas, Box 827, Parkersburg, W. Va.

WANTED: Spudder complete with all tools, capable drilling 3000 feet. Give price, type, conditions and location: Box D-982, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED TANKS

10,000 gallon to 80,000 barrel—any quantity or location

STEEL TANK SALES CO.

1007 First National Bank Bldg.
Cincinnati 2, Ohio

HELP WANTED

WANTED: Capable crude oil scout or assistant crude buyer for aggressive independent refiner. Good salary to right man who probably is in mid 30's. Able pipe line or land department scout may make grade. Petco Corporation, 425 Wilson Bldg., Dallas, Texas.

NATURAL Gas Company located in northwest has opening for recent graduate in natural gas or petroleum engineering for general engineering work in gas utility. Prefer individual with two or three years experience but will consider recent graduate. Replies confidential. Box D-1000, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST

Expanding, integrated, independent oil company has opening for Geophysicist. College graduate with six to eight years geophysical work. Five years as Party Chief or Supervisor. Interesting employe benefits, good salary for qualified applicant. Our employes know of this opening. All Applications held in strictest confidence. Write Personnel Division, P. O. Box 1051, Tulsa, Oklahoma.

CHIEF CHEMIST: Must be a graduate Chemist or Chemical Engineer and have at least four years experience in blending and testing gasoline and fuels. Excellent opportunity in independent company. In reply, give full details of education and experience and include a recent photograph. Box E-114, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced oil field mechanic for gas engines, West Texas and New Mexico area. In field and shop. If interested, reply by letter to: Box E-123, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED:

Exploratory Geologist familiar with and preferably now residing in Southern Oklahoma. Must be aggressive and experienced. Fine opportunity with progressive Independent.

Box D-967, The Oil and Gas Journal Tulsa, Oklahoma

WANTED

REFINERY CONSTRUCTION ENGINEER

to train for managerial position with well known established firm of engineers and contractors. Prefer man with at least ten years of experience in oil refinery design construction and estimating. Applicants should have degree in Mechanical Engineering and previous sound training with oil companies or refinery contractors.

Salary—Commensurate with ability.

Location—Los Angeles, California.

Box E-121, The Oil and Gas Journal, Tulsa, Oklahoma

HELP WANTED

WANTED: Sales representative by old established pumping equipment manufacturer, liberal commission basis. Desirable territories open, all replies confidential. Box D-986, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN and Domestic Oil Employment Directory covering the oil industry, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla.

NATURAL Gas Pipe Line Company located in northwest has opening for gas measurement engineer or accountant, age under forty, for general supervision of gas measurement and accounting for pipe line system. Replies confidential. Box E-100, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

EXPERIENCED TITLE MAN for lease records division major oil company. Give age, experience, education, military status and salary expected. Reply Box D-998, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MAN: Experienced land man for major company operating in Mid-Continent areas. Ages 30 to 45. Excellent possibilities. Replies confidential. Box D-990, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER. Assistant to the Production Manager in Rocky Mountain area. Man with proven production record with 5 to 10 years experience. Salary commensurate with ability and experience. Submit complete details and salary desired. Box E-109, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED rotary driller, also cable tool driller on large water well work. Box E-116, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL REFINERY OPERATOR

Excellent opportunity in well known oil refinery company for first class operator with heavy experience. Attractive salary with considerable overtime plus liberal pension plan and other employee benefits. Write details of education and experience.

Box E-111, The Oil and Gas Journal, Tulsa, Oklahoma

Wanted...

DEALERS and DISTRIBUTORS

Manufacturer of America's largest line of heavy duty Diesels wants oil field distributors and dealers to handle proved line of "packaged" Diesel Units for production pumping, main or standby electric service, and for power applications using stub shaft or clutch power take-off. Exclusive territories are open to active organizations with broad contacts. Please advise accounts being handled, length of time in business and pertinent information on general background of organization.

Box E-125
The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

WANTED: Young man with Crude Oil Purchasing experience — Gulf Coast Area preferred. Please give education, experience and salary expected in first letter. Box D-967, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Aggressive, well integrated strong independent company with comprehensive geophysical program desires geophysicist, 35 to 40 years old. Must have considerable experience, preferably with company background. Experience in Rocky Mountains, West Texas and Southwest Texas desirable. Duties consist mainly of supervision of contract crews and reanalysis of seismic data. Located in company headquarters but considerable traveling involved. Salary dependent on experience and ability. Write giving full details. Replies held strictly confidential. Box E-120, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

REFINERY superintendent desires change. Consider job other than supt. Must give present employer adequate notice. Box E-124, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum and Natural Gas Engineer: 25 years old, single, non-reservist, interested in foreign employment, speak Arabic. Box E-119, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE MECHANICAL ENGINEER desires position in Mid-Continent area. Five years experience in oil industry. Reference and record on request. Box E-122, The Oil and Gas Journal, Tulsa, Oklahoma.

TOOL PUSHER
20 Years Experience
Desires permanent employment with independent oil company. Box E-117, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST — Independently Maintaining Current Assembly of Regional Subsurface Structural Contour Maps of Central and Eastern Oklahoma Desires to Become Associated with Oil Operator on Variable Basis. P. O. Box 1884, Tulsa.

PETROLEUM CHEMIST, B.S.—Seeks responsible position as refinery supervisor, chief chemist or development supervisor. Excellent theoretical background in lubricants and asphalts, backed by extensive experience in varied manufacturing plant operations; transformer oils, industrial lubricants, motor oils, by-products; asphalt manufacturing and development specialties, emulsions; butuminous technology; synthetic petroleum detergents. Personable, creative, good leadership. Box E-112, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING Contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box D-644, The Oil and Gas Journal, Tulsa, Oklahoma.

TECHNICAL SALES—New York mechanical engineer, good technical background with engineering and major oil companies, sales personality and initiative. Know inside company working methods. Excellent man for promoting equipment sales coming refinery expansion. Age 36, reliable but aggressive. $10,000 calibre. Box E-108, The Oil and Gas Journal, Tulsa, Oklahoma.

OGDEN S. JONES
CONSULTING GEOLOGIST

For 15 years Director of the Oil Field Section, Kansas State Board of Health. Can be a valuable service to the oil industry in all problems pertaining to salt water disposal. Ground water geology, direction of water flow, etc. Can qualify as an expert witness in any court.

Address correspondence to:

1505 University Drive, Lawrence, Kansas
Phone 1256

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No 131, Hobbs, New Mexico.

EIGHTEEN years Geophysical experience, foreign and domestic, capable and desirous of organizing and managing complete new geophysical department. Available after due notice to present employer. Box E-110, The Oil and Gas Journal, Tulsa, Oklahoma.

FORMER Independent Oil Operator ten years, with legal education, plus eight years Wall Street experience, desires connection raise funds exploratory well drilling from excess profits taxpayers. Box D-938, The Oil and Gas Journal, Tulsa, Oklahoma.

SUPERINTENDENT AVAILABLE
25 YEARS' EXPERIENCE
GRADUATE PETROLEUM ENGINEER
Box E-103
The Oil and Gas Journal, Tulsa, Oklahoma

GEOLOGIST, now operating as an independent, would like to become associated with operator or group in need of an experienced man, on a salary-interest basis. Have been associated with the oil industry better than fifteen years in geological and geophysical exploration, development, leasing, and other phases of operation. Capable of directing operations and passing on submittals made. Salary of minor importance. Interview can be arranged. Box E-105, The Oil and Gas Journal, Tulsa, Oklahoma.

REAL ESTATE

MODERN well-planned homes in restricted district. Residential, commercial and industrial properties. Clem Casey, Bismarck, N. D.

FOR SALE: Attractive Ranch-type Cottage on beautiful Lake Pelican, Minnesota. Completely modernized. Near Senator Kerr's Cottage. Write J. J. Thomas—Seward, Nebraska.

FOR TRADE

NEW STEEL PIPE. Will trade equivalent tonnage 12¾" O.D. pipe for thirteen miles 8⅝" O.D. pipe. Twelve inch pipe now on hand. Reply Box E-101, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908 Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

NOTICES

MID-VALLEY PIPE LINE CO.
LONGVIEW, TEXAS

Will issue specifications and drawings May 15 and receive bids until June 15th covering building of six complete 5,000 HP Oil Line Pump Stations and extending and adding to seven existing similar stations. Contractors interested in receiving specifications and drawings contact: J. D. Ward, Purchasing Agent, Longview, Texas, prior to May 10, 1951. Copies of drawings and specifications may be obtained by making a deposit of $25.00 which sum will be refunded upon return in good condition of the complete documents within ten days after receipt of same or if used in submitting a bona-fide proposal.

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BANDERA, TEXAS

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

MONTANA ROYALTIES
Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225, Great Falls, Montana.

INDEPENDENT OPERATOR will buy producing royalties, over-rides, or settled production, small or large. Quick action. Box E-118, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

FINANCIAL help wanted to drill hundred sixty 6 possible producing formations; will sell three-quarters based on three hundred dollars per thirty-second if Oil or Gas will complete if dry will return half your money. O. A. Sewell, Coweta, Oklahoma.

FOR SALE: 640 acres Big Horn County, Wyoming (very hot); 20,000 acres in Central and Eastern Montana (scattered counties); 20,000 acres, North Dakota; 30,000 acres, South Dakota; 10,000 acres, Colorado; 30,000 acres, Nebraska (scattered counties). Prices and terms to properly interested parties. Dyer O.J. 1635 Champa St., Denver, Colorado.

FOR SALE: Undivided one-half interest in a 5% over-ride royalty in block of about 25 thousand acres on East terrace of Lemmon-Williston basin South Dakota. Price 60c acre cash Subject. John F. Schoof, Gettysburg, South Dakota.

FOR SALE: West Texas drilling deals, proven and wildcat. We buy Texas production and producing royalties. Navarro Royalties Company, Box 2626, Telephone 6439, Odessa, Texas.

FOR SALE: Have several nice leases in Shelby County, Texas. In Humble and other major Company blocks, lots of activity. Brokers invited. Write for information. C. A. Parker, Center, Texas.

FOR SALE: Mineral rights on 640 acres at Seven Persons, Alberta, Canada, located 20 miles from Medicine Hat, Alberta, called the Gas City of Alberta. Heavy flow of gas nearby and perhaps oil. Apply: Box 36, Seven Persons, Alberta, Canada.

FOR SALE: Oil and Gas Leases adjoining producing leases, also wildcat leases. Drilling propositions and small producing properties; all in shallow territory. W. P. Harley, Bowling Green, Ky.

NEW MEXICO OILFIELDS

We have prepared data of vital interest to royalty & lease buyers covering important oilfield in Roosevelt County & potential fields in Chaves & DeBacca Counties. Also a semiproven drilling operation. Details on request.

W. J. PETERMAN, GEOLOGIST
Portales, New Mexico

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

PRODUCTION

Oil and gas producing leases of great merit that will stand the most rigid investigation. I now have several properties at prices ranging from $250,000 to $1,000,000. Will submit deals complete with geological and evaluation reports to qualified parties. Ideally set up for company financing. Correspondence of accredited investment houses invited. Fullest cooperation assured.

ARTHUR DAVIDOR
Oil Operator 35 yrs. experience
1412 N.W. 38th St., Oklahoma City, Okla.

LEASE AND DRILLING BLOCKS

KANSAS OIL DEALS WANTED: Reputable independent operator and producer solicits your drilling deals. Box D-974, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL DEALS WANTED

By independent operator. If you have a deal that has a good chance of producing, write us at once, describing fully. P. O. Box 2071, Tulsa.

SHALLOW LEASE in Eastern Kansas with one well and flowing part time with #5½ Keystone drilling machine complete. Very reasonable. Box 198, Gorham, Kansas.

LEASE or ½ Royalty 640 acres near well now being drilled at McAlister, Quay Co., N.M. $10/acre; 50c/acre rental each year. Ky E. Drake, McAlister, N. Mex.

FOR RENT OFFICE SPACE

AVAILABLE FOR LEASE: Centrally located office and commercial building, over 26,000 square feet, for long term lease. Steam plant. Parking available. C. B. Lynch, 303 South Cincinnati, Tulsa, Okla.

WANTED

WANTED: 2 to 10 million feet high G.P.M. gas, in South or East Texas for gasoline plant. Operator furnished gas lift gas if desired. Box E-115, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

INVESTMENT OPPORTUNITIES: Wish to contact parties to finance oil drilling deals. Excellent opportunity to invest tax money. Box E-102, The Oil and Gas Journal, Tulsa, Oklahoma.

Kentucky Fields

(Continued from page 179)

Ohio County: Earl Briney 1 Hardin, NW NW SW 16-O-23, dry, TD 900 ft.

EASTERN KENTUCKY

ASHLAND.—In Lea County, Big Sinking pool, Ashland Oil & Refining Co. have announced two new locations: 21 Simpson Crabtree on Big Sinking Creek and 269 Eureka Coal & Mineral Co., on Cave Branch of Big Sinking Creek. Wells will test to and through the Corniferous lime section at approximately 1,000 ft.

In Elliott County, 1 mile north of production in Burke Dome pool, Grant Rice et al are testing 1 Amos Thornsbury. Weir sand was topped at 590 ft. and drilled to 698 ft., total depth. Well was still in sand-logged saturation in two zones. It has been shot with 600 lb. of gelatin and operators are cleaning out and testing.

On Mallett Branch of Carr Fork in Knott County, Glen Spradlin et al have a dry hole at 1 L. D. Huff. With Big lime topped at 2,125 ft., Berea at 2,700 ft., and Devonian black shale at 2,750 ft. only small shows of gas were found to total depth of 3,200 ft. Shooting failed to increase production and well has been abandoned.

LEGAL

7,120 ACRES of Tribal and 80 ACRES of Allotted Indian lands located in Townships 2, 3 and 4 South, Ranges 8, 9 and 10 West, within the jurisdiction of the Uintah and Ouray Reservation, Utah, are being advertised for lease, bids on which will be opened June 7 at 2:00 P.M. at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

LEGAL

320 ACRES of allotted Indian lands located in Township 1 North, Range 1 West, on the Uintah and Ouray Reservation are being advertised for lease, bids on which will be opened May 22, 1951, at 2:00 P.M. at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the NE¼SW¼, Sec. 18, T. 33 S., R. 40 W., 6th P.M., 40 acres within the known geologic structure of the Hugoton gas field, will be offered for oil and gas leasing, through competitive bidding at 1 p.m., Eastern Standard Time, May 23, 1951, when bids will be opened. Details of lease offering, how and where to file bids, and a description of the lands may be obtained by addressing an inquiry to this office. Marion Clawson, Director.

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A High Quality Flux That Remains Molten And Viscous Over A Wide Temperature Range

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